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TRANSPORTATION LIBRARY

Railway Mechanical Engineer

UNIT BRAKE BEAMS *ARE STANDARD ON THE ERIE* ★

★ *"Our records indicate that out of a total of 1,105 freight cars built since 1941, all but five flat cars have been equipped with Unit Brake Beams, or, in terms of per cents, 99.55% have been so equipped."*

(Official figures furnished by the Erie Railroad.)

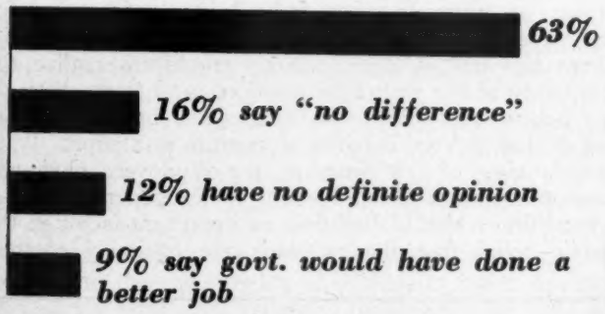
NIT TRUCK CORPORATION **NEW YORK**

What Railroad Employees Think About the Railroad Industry

RAILROAD employees like their work so well that, if they were starting their careers all over, five out of eight of them would go to railroading again. Such is the basic and characteristic disclosure of a survey of railroad employee opinion regarding the railroad industry—conducted for Railway Age, Railway Mechanical Engineer and Railway Engineering & Maintenance by the Opinion Research Corporation of Princeton, N. J.—pioneer organization in the scientific measurement of public opinion by skilled sampling, based on personal questioning by trained interviewers.

Government Ownership

63 per cent of employees say government would have done a worse job than private managements if it had operated the railroads during the war.



The three associated Simmons-Boardman railway papers arranged for this survey because of a conviction, based on long experience in dealing with railway public relations problems, that the opinion of the individual employee is the keystone to successful relations of the railroads with the public—just as, also, what the employee thinks about his job and his company is the raw material from which the industry's labor relations, be they good or bad, is made.

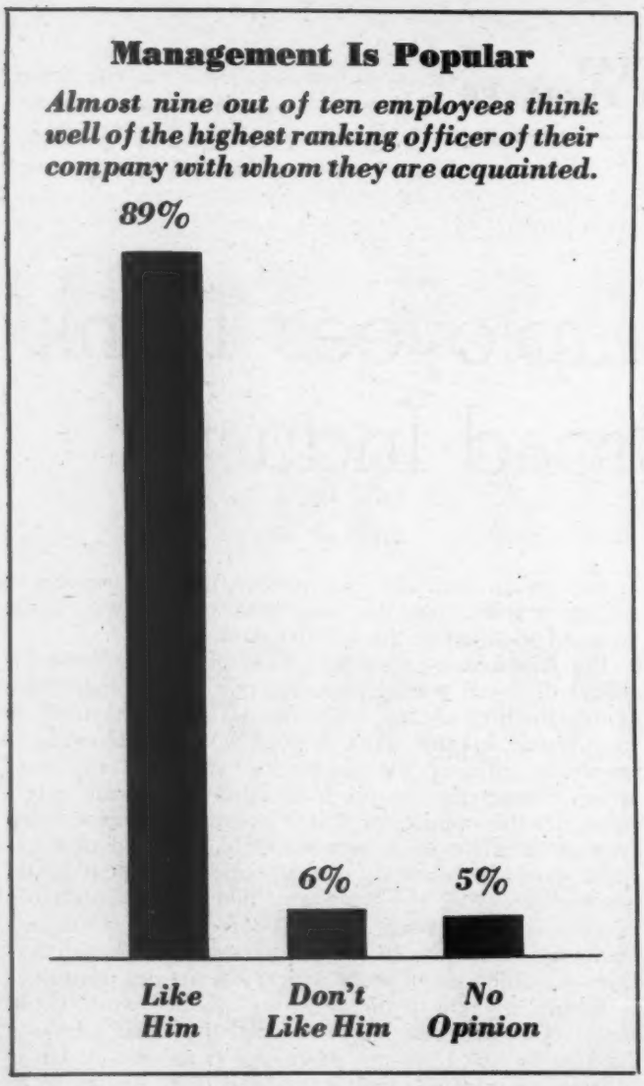
These publications were motivated by the belief that, the factor of employee opinion being as important as it is to the well-being of the railroad industry, an effort should be made to get some definite knowledge about it—rather than to continue to rely on opinion and intuition, however persuasive. No matter how accurate shrewd guesses or "hunches" on such questions may be, beliefs thus derived cannot be checked, and, conequently, it is not possible to act upon them with the same assurance as with those founded on objective quantitative data.

For example, a personnel officer of the telephone industry observed several years ago that the employee relations situation of the railroads was fundamentally a healthy one, because most railroad work is interesting—involving little of the depressing repetitive processes which characterize so much of other large-scale enterprise. In the opinion of this telephone executive, such friction as might exist between employees and management should be relatively easy to remove—since it would all have to arise, not from any inherent characteristic of railroad work itself, but either from (1) misunderstanding of the facts of the business or (2) from irritations in conditions of work which, not arising from anything fundamental in the nature of railroad work, could be corrected with relatively little difficulty. That diagnosis can now be said to be no longer merely an opinion but is in large measure elevated by this survey to a position of objective scientific fact. That is to say, a substantial majority of railway employees do—undeniably now—like their work so well that, if they were starting in all over again, they would still go to railroading.

"It's in My Blood"

Further evidence on this point is provided by the reasons those employees (62 per cent) who like the work give for liking it, (with the relative frequency of each reply indicated by the figure following it in parentheses): Enjoy the work (41); "railroading is in my blood" (19); steady employment (16); company is "fine to work for" (13); pay is satisfactory (8); chances of advancement (7); am qualified for the work (6); like the pension plan (5). The minority who do not like their jobs (31 per cent), for the most part, give such reasons as better opportunities for advancement elsewhere (34); prefer another kind of work (22); could make more money elsewhere (18); would like better or more regular hours (12); would like better working conditions (10); railroad work is too hard (7); railroads are going downhill (4); i. e., only a relatively small ratio (less than one-fourth) name some objection which is inseparable from railroad work.

Moreover, when asked what topic they would most like to talk about to an executive of their company, almost as many respondents mention some means of improving railroad service as name either wages or working conditions. Specifically, the questions employees would most like to discuss with management, with their relative numerical weights are: wages, pensions, and


Management Is Popular
Almost nine out of ten employees think well of the highest ranking officer of their company with whom they are acquainted.
89%
6%
5%
Like Him
Don't Like Him
No Opinion

Sunday and holiday pay (22); better working conditions (19); improvements in equipment and service (19); no opinion (18); shorter hours and better shifts (6); railroading in general (6); future of the company, how to attract new business (5); greater safety for employees and passengers (4); personal problems (4).

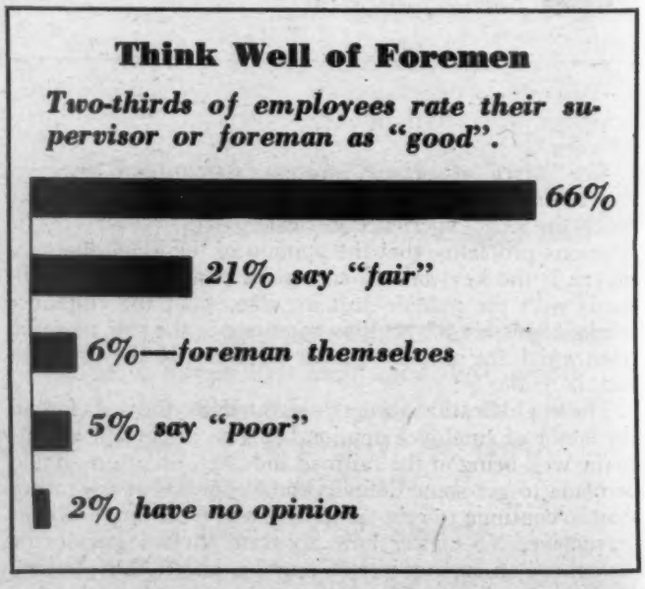
No other industry is so dependent as are the railways on a friendly public opinion—because no other industry is so minutely regulated, not alone by the federal government but by government at every level and in every locality. Every operation of the railways is surrounded, not only by the edicts of regulatory commissions, administrative officials, legislatures and city councils, but by an enormous and rapidly growing competing transportation plant provided at government expense—so that, without a relatively high degree of friendly understanding by governmental agencies and officials, the railroads could not only have no hope of profitable operation; they could scarcely operate at all. The opinions of millions of people form the governmental environment which determines whether the railways will be permitted to thrive or will be strangled; and this popular opinion is largely the product of the contact of the traveling and shipping millions with individual railway employees. Relatively few of the public are in touch with railway management; to most people the railroad employees—be they good or bad, informed or ignorant—*are* the railroads.

The Opinion Research Corporation has conducted annual surveys of public opinion for the Association of American Railroads for the past five years. In the 1945 survey (see summary in Railway Age, November 3, 1945, page 717), it was disclosed that 74 per cent of the public favored fair and equal treatment of all forms of transportation; but, at the same time, 62 per cent of those who had an opinion (16 per cent had none) believed that such equality of treatment had already been attained. The fact that the railroads have to build, maintain, and pay taxes on their roadways—while improved waterways are built and maintained by the taxpayers without any contribution by vessel operators—has made no significant impression whatever on a majority of the public, which seems equally unaware of the inequality of treatment accorded the railroads which is inherent in the fact that commercial highway and air transport facilities are paid for in large measure from the proceeds of general taxation.

The Principal Factor in Public Opinion

There are some 1,400,000 railroad employees—about 1 per cent of the total population. It seems scarcely likely that 51 per cent of the total population (62 per cent of those with an opinion) would hold the view, as the A. A. R. survey shows it does, that the railroads, highways, waterways, and air transportation all have equally fair competitive environment unless railway employees also held some such opinion of the railways' relative competitive position. The Railway Age survey of railroad employee opinion confirms this surmise. It discloses that 64 per cent of railway employees believe that, prior to the war, railroads, airlines, and waterway and highway carriers all had an equal chance to make a fair profit.

This substantial majority of employees reached this conclusion despite the fact that an even slightly larger ratio (68 per cent) is aware that railway taxes—all going for general governmental expenses, and none for providing railroad facilities—are more burdensome than the taxes paid by other forms of transportation, such taxes (or, more properly, fees) being largely used for the payers' own benefit. The inference is that, while about two out of three railroad employees realize the inequality of the railroads' position as to taxes, they do not believe that this inequality has any important bearing on the railroad's ability to operate at a profit. With such a view of the situation, the employees obviously cannot explain it any differently to the general public—a condition which is doubtless an important factor in the public belief that the railroads are equitably treated.

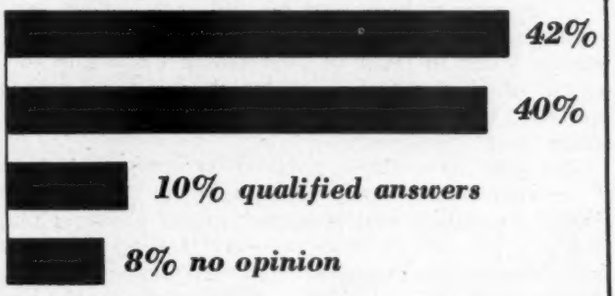


Tolerant of "Federal Aid"

Only 61 per cent of railroad employees realize that there have been "federal aid" appropriations for competing forms of transportation, and one employee out of three believes that such appropriations are a "good idea." Of the 28 per cent of employees who believe that the tax-and-regulatory situation before the war did not give the railroads an even chance to earn a profit, just about half would correct the condition by equalizing conditions of taxation and self-support. The remainder would achieve equality through changes in regulation and in adjustments in the rate level. Only 41 per cent of employees are aware of the present controversy over rate regulation—as typified by the Justice Department's and the State of Georgia's anti-trust suits against the railroads, which, if successful, would destroy the "conference" or "bureau" mechanism for initiating rate changes, under I. C. C. regulation—and this 41 per cent is quite lacking in positive convictions as to what rate procedures should be. None of the respondents mentioned the Bulwinkle Bill (which has already passed the House of Representatives and which would remove all question of the legality of the "conference" method of rate-making).

Danger from Competition?

42 per cent of employees believe that competition from other forms of transportation will bring hard times on the railroads, while 40 per cent don't think so



So little importance is, apparently, attached by employees to the contribution of politics to the competitive difficulties which the railroads encounter that only one employee out of six was able to name a candidate for public office (local or state) whom the employee believed to be in favor of policies to assure fair competitive conditions in transportation.

And yet—despite the evident lack of definite understanding by employees of the principal source of the railways' competitive difficulties and, hence, of the means and the place where correction must be forthcoming if such dangers are to be mitigated—there is a substantial minority (42 per cent) who believe that competition is going to bring hard times to the railroads and their employees. (The Far West is more optimistic with only 32 per cent.) On the other hand, almost 3 employees out of 4 (70 per cent) believe that railroad management is doing all it can to meet this competition; hence the viewpoint of a considerable number of employees is rather fatalistic—they conceive that the situation is serious but they do not know of anything that can be done about it.

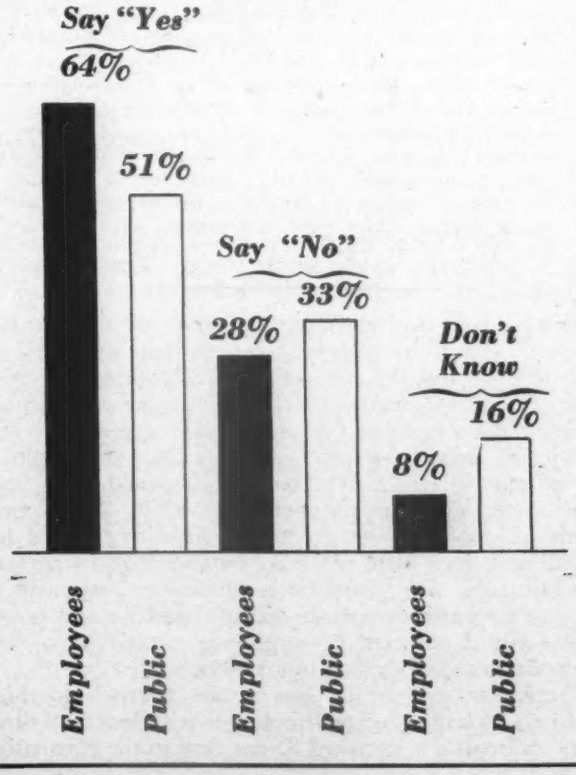
Affirmative responses considerably below the 70 per cent average were given by train, engine and yard and "other" transportation employees (66 per cent for both groups); by younger employees (57 per cent by those under 30 years of age); and by railroaders in the Far West (58 per cent). Twenty-six per cent of the employees say that railroad officers are "less progressive" than the managers of air and truck lines. On the question of whether railroad managements are as progressive as those of rival transport agencies—in which the overall "yes" answer was 60 per cent—below-average opinions were given by younger employees (e.g., 45 per cent by those under 30 years of age) and by employees in the Far West (50 per cent).

Such data appear to justify the conclusion that a substantial proportion of railroad employees would be receptive to an explanation of the railroads' competitive situation in terms of the diagnosis which prevails among most students of the transportation situation, viz., that the railroads' primary need is equality—relative to all other forms of long-haul transportation—in taxation, in their degree of self-support, and in regulation; and that, given such equality, the industry might look forward to a future as prosperous as that of any other well-established and economically useful enterprise.

The A. A. R. public opinion survey, mentioned heretofore, showed that the public appreciates the importance of railroads and wishes them well—but is unaware that their well-being is in any way threatened. The survey of railway employee opinion discloses loyalty to the industry and pride in its accomplishments, plus substantial misgivings as to the future. That is to say, the employees share with the general public a feeling of good will toward the railroads and a realization of the public importance

Is Competition Fair?

Here is how employees and general public answer question: Before the war did the railroads have a chance to earn a profit equal to that enjoyed by other forms of transportation?



of the industry—but the employees are more apprehensive as to the future of the industry than the general public is. The employees are aware of inequality in taxation as between the railroads and rival agencies of transport, but, seemingly, do not ascribe any special significance to this factor. If, as most persons who have informed themselves on the railways' competitive situation believe, the establishment of a greater degree of equality in taxation and self-support among all agencies is essential to any enduring and dependable prospect for railroad prosperity, then it is evident that considerable public and employee education in the basic economics of transportation will be required. In such an effort, obviously, the employees should come first, since it is quite unlikely that the public in general will be sufficiently interested to learn more about the business than people actually engaged in it.

Friendliness to Industry Is Employees' Basic Attitude

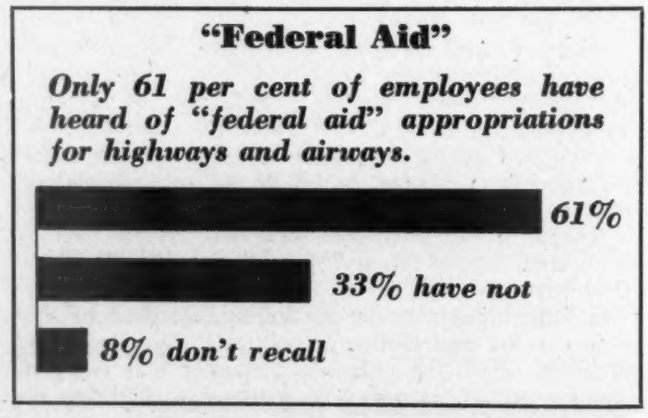
As indicated at the outset of this report, the central characteristic of this survey is its revelation of the basic friendliness of railroad employees to their industry. They appear to esteem it for its accomplishments in war-time. It has already been noted that five out of eight employees would enter the railroad industry all over again, if they had their lives to live over. The employees think well, also, of their superiors. Asked to name the highest officer of their company whom they had met or talked with, 30 per cent mentioned a president or vice-president, and an additional 44 per cent mentioned a general manager, general superintendent or superintendent; only 6 per cent expressed a poor opinion of the ranking officer they had met. Practically nine out of ten employees have a definitely favorable impression of the top management of their company so far as it is known to them. Of their immediate superiors—foremen and supervisors—only one employee in 20 expressed an unfavorable opinion, while two-thirds of the employees questioned rated their foreman as "good."

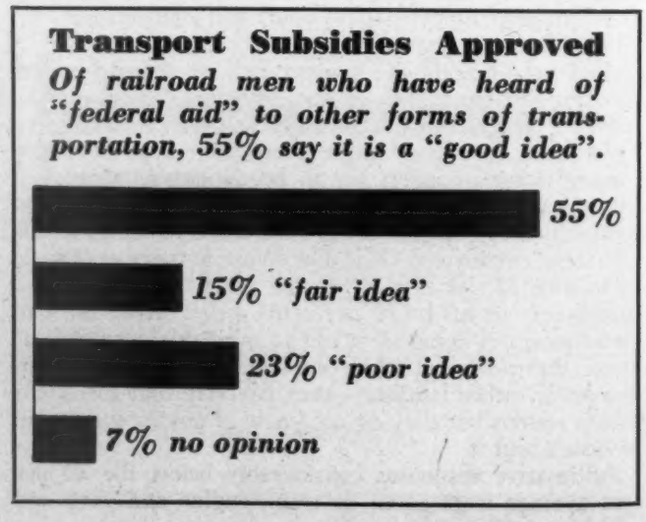
In a survey of opinion of employees of the manufacturing industry—sponsored by the magazine "Factory" and conducted, as the Railway Age survey has been, by the Opinion Research Corporation—respondents were asked to state their opinion of their union leadership. In the Railway Age survey no such question was asked because, in the railroad industry, unlike manufacturing, there is no compulsory union membership—no "closed shop," no "maintenance of membership," no "check off." Under such conditions of complete freedom, the membership of an overwhelming majority of railway employees in labor organizations is sufficient evidence of their confidence in and loyalty to those organizations. Since the number of questions which an interviewer can ask a respondent is limited, the Railway Age survey did not go into matters about which reliable quantitative information was already available.

Not only do overwhelming majorities of railroad employees respect the qualifications of their superiors—at both the top and the supervisory levels—but they think well of the performance of their industry as a whole. Nine employees out of ten say the industry did the best war job it could have done—and less than one employee out of ten believes that a better job would have been done under government operation; while almost two-thirds of employees believe that a definitely worse job would have been done if the government had taken over the railroads. For peace-time, employee sentiment in favor of government operation can almost be said not to exist—only 3 per cent of employees expressing a definite preference for such an innovation.

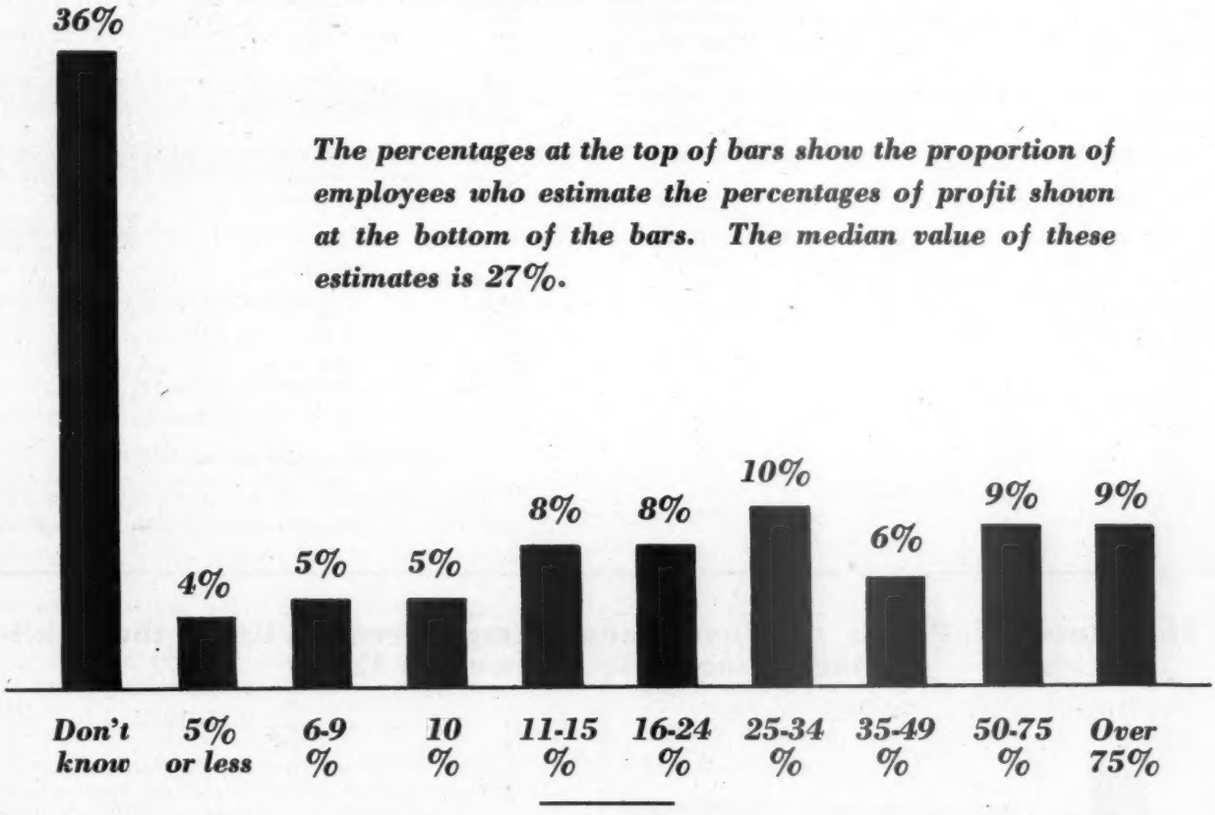
There was some difference in the answers to these questions by large groups. Employees with less than three years' railroad service voted 83 per cent in the affirmative and the ratio of "yes" answers rose with length of service, reaching 92 per cent on the part of employees with 35 or more years of service. On the other hand, of the nine per cent who believed that the government would have done a better job of wartime railroading than private management did, employees with less than three years' service voted in favor of government ownership to the extent of 15 per cent of the total and this percentage dwindled to only five per cent for employees with 35 or more years of service.

The vote for war-time government operation was only 3 per cent among employees residing in cities of under 25,000 population, and was much higher in larger places (e.g., 11 per cent in cities of over 500,000). There was less friendliness toward government operation in the Midwest (6 per cent) than in other territories (the South leading with 12 per cent). Tolerance of peace-time government operation was only 3 per cent by employees as a whole—but here again the acceptance of such socialization was highest among the younger employees and among those living in large cities. It was much higher


"Federal Aid"
Only 61 per cent of employees have heard of "federal aid" appropriations for highways and airways.
61%
33% have not
8% don't recall


Transport Subsidies Approved
Of railroad men who have heard of "federal aid" to other forms of transportation, 55% say it is a "good idea".
55%
15% "fair idea"
23% "poor idea"
7% no opinion

The Rate of Profit Employees Believe the Railroads Earned in 1944



The percentages at the top of bars show the proportion of employees who estimate the percentages of profit shown at the bottom of the bars. The median value of these estimates is 27%.

(Interstate Commerce Commission statistics show that the rate of return earned on the investment in railroad property in 1944 was 4.18%)

in the South (8 per cent) than in other territories. Tolerance of government ownership ran lowest in the "officials and clerks" occupational classification, and highest in maintenance of way, mechanical, and stores.

Beliefs About the Investors' Share

With all their loyalty to their industry and approval of its war-time accomplishments, it cannot be said that employees' knowledge of the economic situation of their industry from a standpoint of capital supply is remarkable for its extent or accuracy.

The true measure of profit is the return earned on "venture capital," i. e., on stock, but popular opinion sometimes considers profit to be the ratio of earnings on total investment or on the ratio of stockholders' earnings to total "turnover" (gross revenues). The annual report of the Interstate Commerce Commission for 1945 shows that 1944 net income (i. e., after taxes and interest) was 7.76 per cent of stock and that actual dividends were 3.09 per cent of stock. Net railway operating income (i. e., after taxes but before payment of interest) was 4.18 per cent of the investment in railroad property and net income was 7.77 per cent of gross revenues. Whichever one of these ratios be taken as the measure of railroad "profit," however, it is evident that the actual rate, even in such a relatively prosperous year as 1944, is far lower than the median of 27 per cent of the opinion of employees as to the size of the owners' share in railroad earnings.

More than one-third of the employees questioned in this survey would not even try to estimate the present rate of railroad profits, although 93 per cent said the railroads are now making a profit. Asked to hazard a guess as to railroad profits "last year" (the question was asked in December, 1945), those who accepted the invitation ranged in their estimates all the way from 5 per cent or less to more than 75 per cent, with the median of the guesses being 27 per cent. There were no wide differences in estimates between territories or age groups —but there was a considerable difference among departments. The "officials and clerks" category came closest with a median estimate of 14 per cent, while train, engine, and yard employees were furthest away, the median of their guesses being 34 per cent.

Consider 10 Per Cent a Reasonable Return

Even more noteworthy is the revelation of this survey that 73 per cent of employees believe that the railroads "made a profit" throughout the depression and, furthermore, the employees are quite generous in the rate of profit they believe the railroads should earn. Their opinions range all the way from less than 5 per cent to more than 50 per cent, with a median at 10 per cent. This was the same for all classes of employees—whether by occupation, by seniority, by territory or by age.

Profit being accurately defined as the reward of "venture capital," i. e., the return to stockholders on their investment, the Interstate Commerce Commission's annual reports list the net income available to railroad stockholders at the following percentages to stock outstanding during the 15 years prior to 1945:

Year	Per cent net income to stock	Year	Per cent net income to stock
1930	5.77	1938	deficit
1931	1.69	1939	1.44
1932	deficit	1940	2.49
1933	0.26	1941	5.87
1934	0.23	1942	10.45
1935	0.53	1943	10.03
1936	2.23	1944	7.76
1937	1.49		

The Interstate Commerce Commission annual reports also show the following average rates of dividends on all stock for the 15-year period:

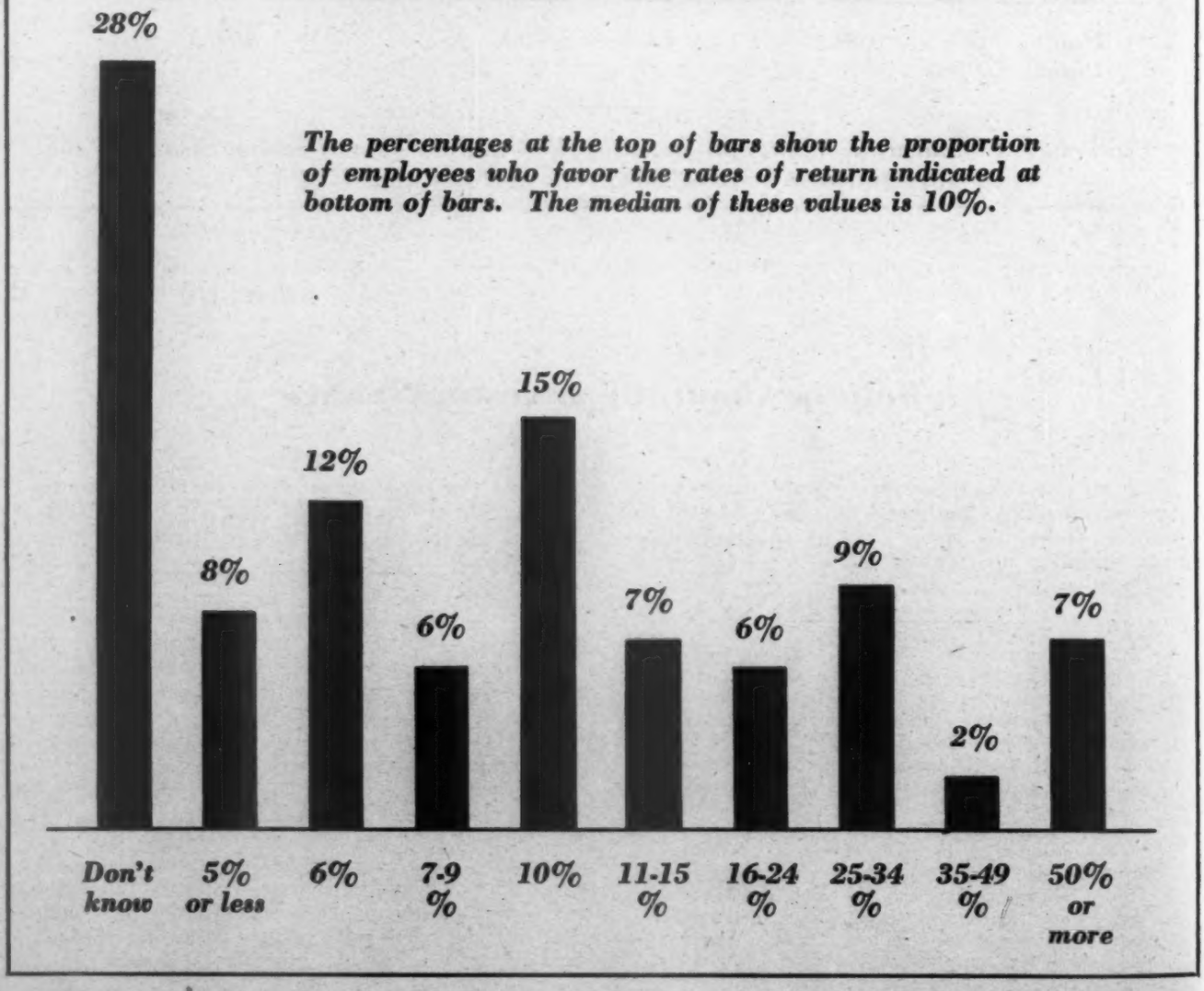
Year	Average dividend, per cent	Year	Average dividend, per cent
1930	6.02	1938	1.39
1931	4.01	1939	1.84
1932	1.50	1940	2.22
1933	1.58	1941	2.52
1934	2.13	1942	2.67
1935	2.04	1943	2.83
1936	2.33	1944	3.09
1937	2.32		

The I. C. C. reports further reveal that the following percentages of outstanding railroad stocks have received no dividends whatever in the past 15 years:

Year	Per cent of stocks Receiving no Dividends	Year	Per cent of stocks Receiving no Dividends
1930	23.07	1938	67.93
1931	26.80	1939	67.36
1932	67.15	1940	61.71
1933	68.89	1941	59.35
1934	65.74	1942	43.63
1935	65.61	1943	42.03
1936	63.80	1944	41.54
1937	60.36		

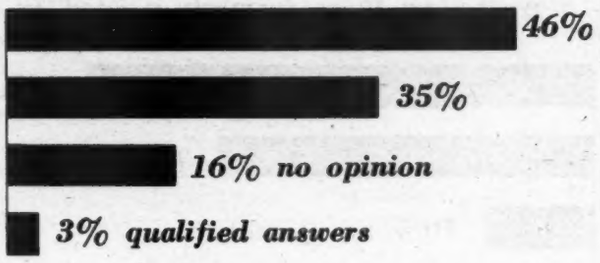
Half of the employees (51 per cent) say either (16 per cent) that they do not know whether employees or stock-

The Rate of Profit on Investment Employees Believe the Railroads Should Be Allowed to Earn



How Are Earnings Shared?

46 per cent of employees say that employees get the larger share of railroad revenue, while 35% say that the stockholders get the larger share.



(I. C. C. figures indicate that wages were approximately 41% of 1944 railroad revenues and that dividends to stockholders were slightly more than 3%).

holders get the larger share of the revenue dollar or (35 per cent) that the stockholders get the larger share, while 46 per cent correctly name the employees and 3 per cent are noncommittal.

The I. C. C. reports the percentage of the revenue dollar paid out to employees during the past decade as follows (with the dividends paid to stockholders shown alongside, computed from I. C. C. statistics):

Year	Per cent of revenue paid in wages	Per cent of revenue paid in dividends
1935	47.62	5.87
1936	45.61	5.72
1937	47.66	5.46
1938	48.97	3.82
1939	46.64	4.49
1940	45.71	5.04
1941	43.61	4.48
1942	39.27	3.40
1943	38.88	2.91
1944	40.88	3.10

Further evidence bearing on the employees' knowledge of the importance of a supply of capital to the railroads in enabling the industry to provide gainful employment is given in the answers when respondents were asked to estimate how much capital the railroad industry had invested per employee. Only 51 per cent of those asked ventured to offer an estimate, with the answers ranging all the way from less than $1,000 to more than $100,000, and with the answers showing little tendency to centralize about any one value. The median of the answers was $9,300.

In 1944 the railways' investment was $26,631,654,000, according to the I. C. C. 1945 annual report, and the average number of employees was 1,414,776, making the average investment per employee $18,824.

In "Labor's Monthly Survey," issued in January, 1945, by the American Federation of Labor, under the heading "Four Commandments of Progressive Collective Bargaining," the following advice in part is given to organized employees:

"Know your industry and know your company. Get such facts as: Costs of operation, outlook for sales and production, particular problems of your company industry, past profits and prospective profits. Know what a wage increase will cost and what the company can pay. . . .

". . . reserves must be laid aside to buy new machinery which will increase productivity and make further wage gains possible; and investors must receive enough return on their investment to bring your company adequate financing. You cannot expect all the profit to go into wage increases.

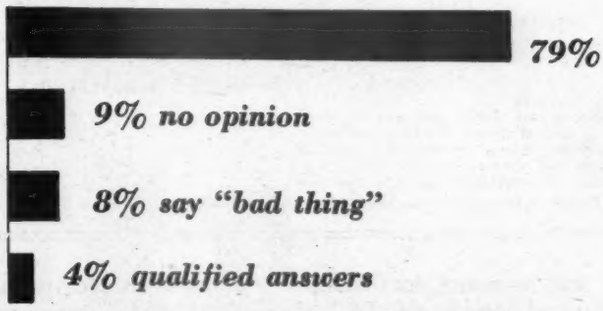
"Work to improve production per man-hour, so there will be more income to share. . . ."

The foregoing quotation, no doubt, would be subscribed to by most of the railway labor organizations, since most of them are affiliated with the American Federation of Labor. There may be some question, however, from the status of employee knowledge of the railroads' financial problems as revealed by this survey, whether these principles are as yet fully comprehended and practiced by the majority of railroad employees. The same question may be raised, particularly, of the A. F. of L. advice to "improve production per man-hour" in the light of the opinion of railroad employees on "full crew" and other such limitations on output per employee as disclosed hereinafter.

The belief was expressed by 79 per cent of the respondents in this survey that a "full crew" requirement is a "good thing for the railroads" and 64 per cent think that limitation of the length of trains would also be "a good thing." Trainmen, enginemen, and yard employees voted 79 per cent and 75 per cent, respectively, in the affirmative on these two questions. Asked whether they thought that such restrictions would force the railroads to increase rates and thus drive away traffic, half of all employees answered in the negative; 20 per cent said they did not know; and 12 per cent believed that these restrictions would discourage traffic, but favored them anyhow.

"Full Crews" Favored

79% of employees believe that "full crew" requirements are "a good thing for the railroads".



The interdepartmental variations in the opinion of those favoring the full-crew and train-limit requirements are as follows:

	Per cent favoring "full crews"	Per cent favoring "train limit"
Officials and clerks	63	44
Maintenance of way employees	78	58
Shop and stores employees	83	65
Train, engine and yard	86	75
Other transportation employees	77	69

The differences in opinions on these two controversial questions as between territories and as between older and younger employees were not great enough to be of any particular significance.

Matters Affecting Employees' Interests

On the matter of the use of labor-saving machinery employee opinion is more favorably inclined— 46 per cent of respondents favor the introduction of such machinery, even where it results in displacing employees; 34 per cent oppose improved machinery; 10 per cent qualify their answers; and 10 per cent express no opinion.

Also bearing on the question of railroad employees' economic ideas are their answers to the question: "What might be done to make your job more satisfactory?"

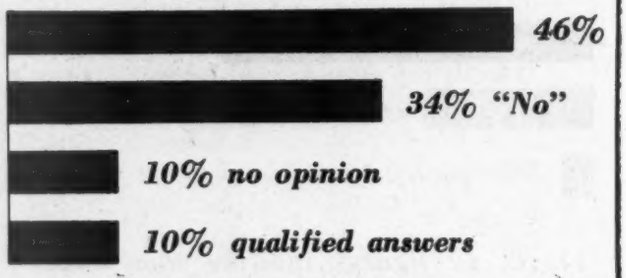
Only One in Five Asks for Higher Wages

Only 21 per cent of respondents mentioned higher wages; an equal ratio named better working conditions; 18 per cent asked for better hours of work. Half of the employees (49 per cent) stated that they were satisfied with their jobs and had no suggestions to offer for improving them. This answer was lower (44 per cent) than the average by train, engine, and yard employees. It was lower also (41 per cent) with employees of less than 9 years' seniority. It was lower (41 per cent) in cities of over 500,000 population; and it was much lower (only 37 per cent) in the Far West than in other territories.

The departmental differences in suggestions for making their jobs better are rather noteworthy, and the tabulation as compiled by the Opinion Research Corporation is included.

Labor-Saving Machinery

46% of respondents favor adoption of new machines which require fewer employees than those formerly needed.



hours dwarfs their interest both in more money and in better working conditions.

Compared with this evidence of relatively moderate interest in higher wages and improved working conditions, the answers received on the subject of pensions may occasion some surprise. As is generally known, railroad pensions—which may run up to $120 monthly—

How Departments Differ on Job-Improvement Suggestions

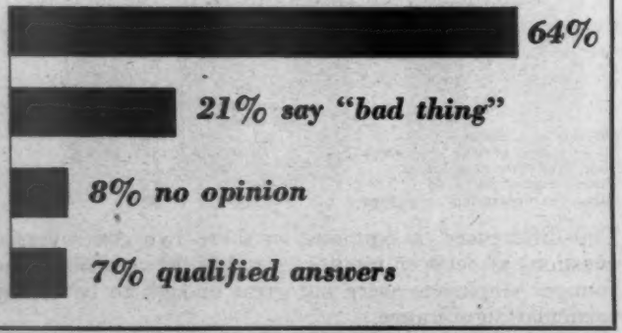
	Better working conditions	Higher wages	Better hours	New equipment and machines	Better labor-management relations	Give us more workers	More opportunity for advancement	Too much to do	Other	Don't know
All Workers	21	21	18	13	12	9	7	6	8	3
Officials and clerks, per cent	16	25	14	1	17	9	14	11	9	2
Way and structure workers, per cent	25	23	14	7	9	16	5	7	14	4
Shop and stores workers, per cent	27	20	11	17	11	10	7	5	4	3
Train and yard crews, per cent	16	19	27	17	13	4	5	3	10	4
Other transportation workers, per cent	27	23	21	13	7	19	3	10	6	1

Percentages add to more than 100 because of multiple answers.

It will be noted, for example, that higher wages is the principal interest of the "officials and clerks" category, but that, for train service employees, the desire for better

Train Limitation

64% of employees believe it would be a "good thing" to place a regulatory limit on the number of cars permitted in a train.

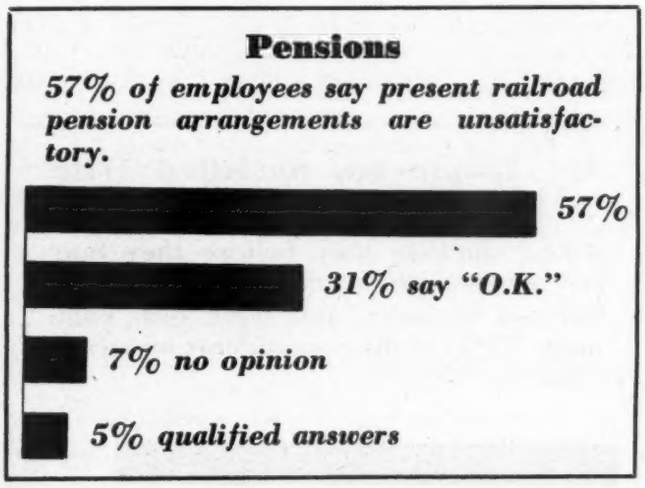


are more generous than the $85 maximum provided for other citizens under the Social Security Act (although somewhat less liberal in auxiliary benefits to a pensioner's survivors). Nevertheless, this opinion survey among railroad employees found 57 per cent dissatisfied with present railroad pension arrangements; only 31 per cent satisfied with them; while 7 per cent had no opinion and 5 per cent gave qualified answers. The principal criticisms of the pension system in the order of their importance (with numerical weights to show the relative number of times each criticism was mentioned) are as follows: Payments not large enough (47); lower the age limit (46); reduce the length-of-service requirements (27); should pay compensation to a widow or child (9) (a widow can now draw a pension only if the pensioner's own benefits are reduced). The dissatisfaction ran much higher among older employees and in the larger cities than among younger employees and in smaller communities.

The unemployment insurance system on the railroads —paid for entirely by the railroads by a 3 per cent tax on payrolls, and which has piled up a fund of almost $700 million because the tax on the railroads so greatly exceeds the occasion, so far, for unemployment compensation—is not well understood by many railroad employees. In fact, 51 per cent of them believe that em-

ployees contribute to this fund, and only 31 per cent realize that the whole cost is paid by the railroads. The ratio of employees possessing this knowledge was highest (39 per cent) in the "officials and clerks" category and lowest (26 per cent) among shop and stores employees. It was far lower (only 20 per cent) in the South than in other territories. A little more than half of the employees (53 per cent) say that the present arrangement for unemployment insurance is satisfactory; 26 per cent have no opinion of it (many of them volunteering the comment that they have had no occasion to find out about it since they have not had to use it); 18 per cent say the arrangement is unsatisfactory; and 3 per cent express a qualified opinion.

Among the 18 per cent who are dissatisfied with the present provisions for this insurance, by far the most important complaint is in the amount of the benefits. Other criticisms, much less frequently mentioned, include



the contention that the benefits should cover time lost through illness—while an equal number of respondents believe this insurance should be abolished because, as they say, "it encourages loafers."

Asked what they think of the chances for promotion in railroad work, 40 per cent answered "good", while 30 per cent said "just fair", and 22 per cent said "not very good." There were 7 per cent who gave qualified answers and 1 per cent had no opinion. The "old heads" voted "yes" more frequently than did the younger employees: 36 per cent of employees with less than three years of service said "yes", while affirmative answers pere given by 48 per cent of employees with 35 or more years of service.

Suggestions on Promotion

Asked what might be done to improve chances for promotion, 45 per cent of those who thought chances of promotion "just fair" either could offer no suggestions at all, or gave answers too diverse to classify; 16 per cent of this group favored lowering the retirement age as a means of improving the chances for promotion; 12 per cent called for more education and training; 8 per cent said "eliminate favoritism"; 7 per cent said "eliminate seniority"; 4 per cent said "expand the business."

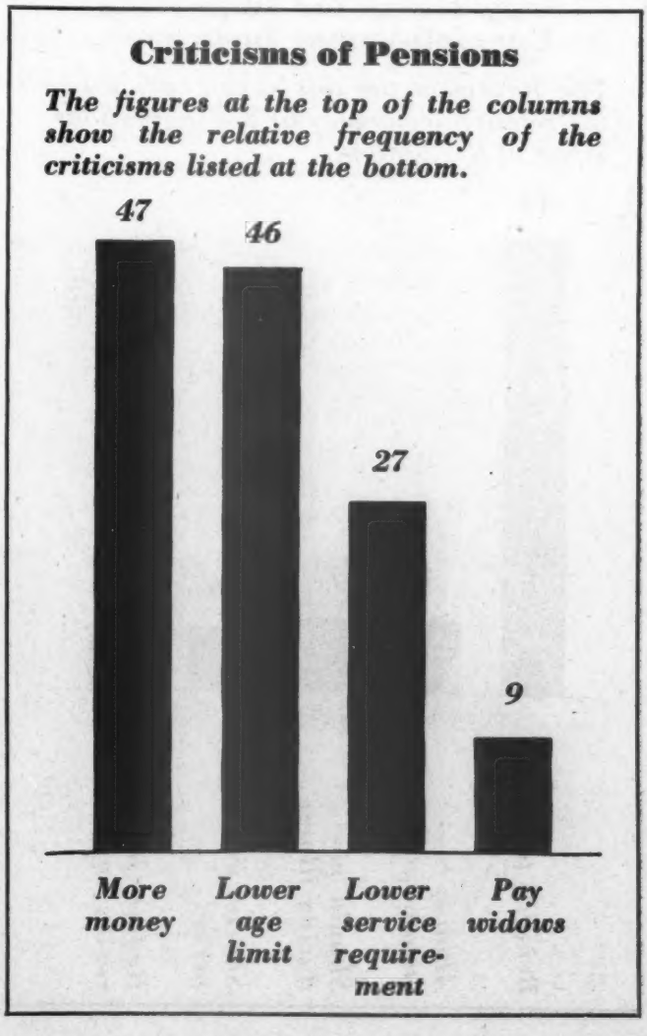
Of the group which characterized chances of promotion as "not very good" 42 per cent could either offer no suggestions for improving these chances or gave answers too varied for classification; 12 per cent asked for a lower retirement age; 7 per cent asked for more education and training; 20 per cent said "eliminate favoritism"; 7 per cent said "promote according to ability"; and 10 per cent said "eliminate seniority."

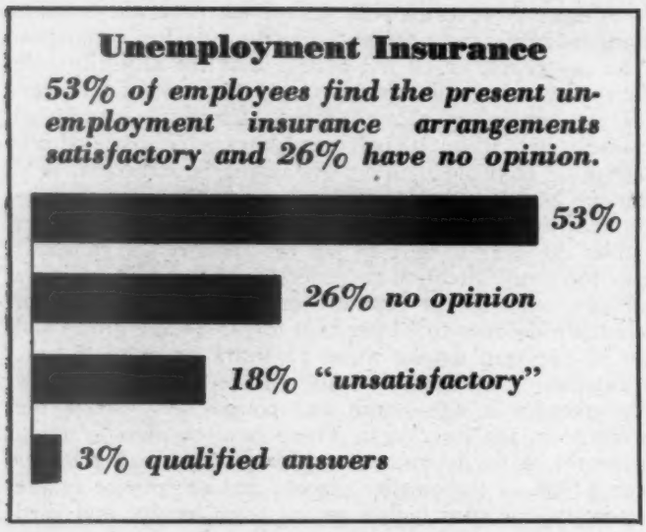
Almost three employees out of four are either quite satisfied with the present seniority rule for promotion (62 per cent), or do not believe that the seniority rule is applied with sufficient vigor (11 per cent). However, 17 per cent believe that too much importance is attached to seniority, while 10 per cent either gave qualified answers or have no opinion. As might be expected, it is among the younger employees where the greatest dissatisfaction with the seniority rule occurs. Of employees under 30 years of age, 38 per cent believe the railroads pay too much attention to seniority; of those 30-44 years of age, only 18 per cent are critical; and the ratio of criticism declines to 13 per cent for 45-54 age group and to 10 per cent among those 55 years or more in age. Criticism of the seniority rule runs considerably below the average in the South and considerably above the average in the Far West. There is more dissatisfaction over the seniority rule among employees in the larger cities than in the smaller places; and acceptance of the seniority rule runs higher among train, engine and yard crews than among other classes of employees.

Dissatisfaction with opportunities for promotion are also more pronounced among the younger employees. Of those under 30 years of age, 27 per cent are critical. The ratio declines to 23 per cent with 30-44 age group, to 21 per cent with the 45-54 group, and to 16 per cent among employees 55 years of age and older.

Job Training

On the question of training for their jobs, 57 per cent of employees believe that present arrangements are satisfactory; 33 per cent say they could be better; and 10 per

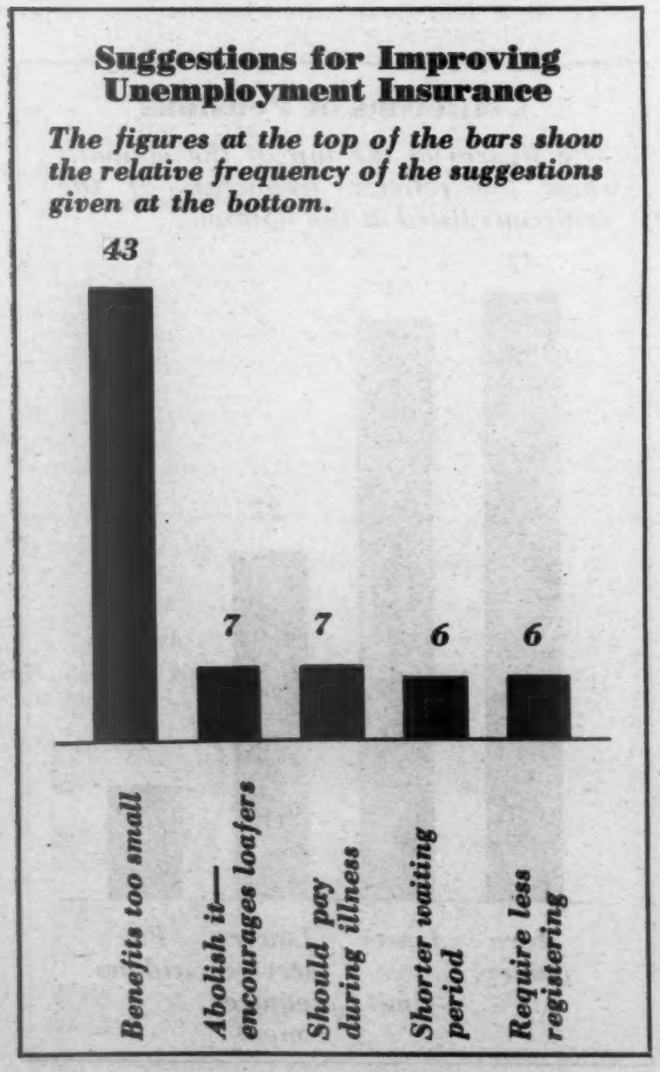



Unemployment Insurance
53% of employees find the present unemployment insurance arrangements satisfactory and 26% have no opinion.
53%
26% no opinion
18% "unsatisfactory"
3% qualified answers

cent either have no opinion or give qualified answers Asked how present provisions for employee training could be improved, 33 per cent of the group who are critical of existing training say that they now receive no training at all; 16 per cent believe the training they get should be more thorough; 13 per cent believe the training period should be lengthened; 12 per cent say more capable instructors are needed; 7 per cent believe employees should be trained before starting to work; 5 per cent ask for a system of apprenticeship; 4 per cent want pay while learning; 14 per cent have views too varied to classify; and 4 per cent have no opinion.

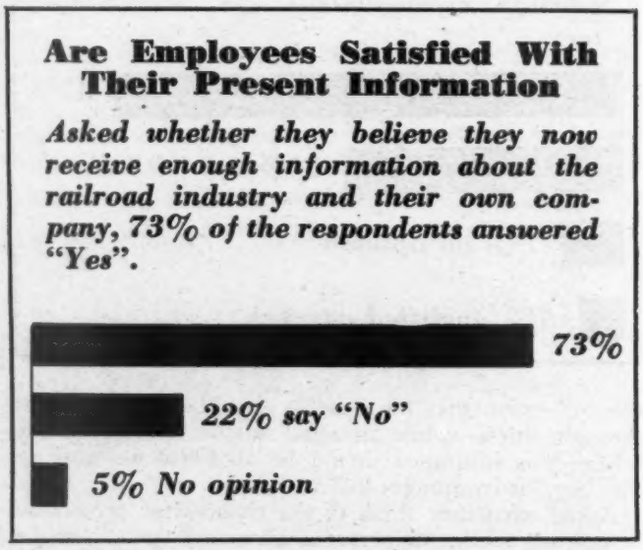
On the subject of training employees for their jobs, on which 57 per cent of employees as a whole said that present arrangements are "good enough," there was a below-average affirmative response (52 per cent) by employees under 30 years of age and an above-average reply (64 per cent) by employees 55 years old or more. The "good enough" answer was below average (52 per cent) in the Far West.

Of employees as a whole, 66 per cent gave a "good" rating to their immediate superiors—but younger employees and those in cities of over 500,000 population fell far below this average. (The affirmative was 51 per cent among employees with less than three years' service and 59 per cent among those living in the largest cities.)



Inter-Union Rivalry

Although this survey did not go into questions of union policy to any extent, one question regarding union policy was asked, viz.: "Sometimes a union tries to get more members by asking men in other unions to join theirs. Do you think it's all right for unions to do this or not?"


Are Employees Satisfied With Their Present Information
Asked whether they believe they now receive enough information about the railroad industry and their own company, 73% of the respondents answered "Yes".
73%
22% say "No"
5% No opinion

This is *one* question of union policy to which, heretofore, an answer has not been available—and that it is important is attested by the annual report of the National Mediation Board wherein the opinion is expressed that so-called "raiding" by one union of another has been carried on to an excessive degree.

The respondents who believe the practice to be "all right" were 22 per cent of the total; those who say the practice is "not all right" were 57 per cent; 16 per cent had no opinion; and 5 per cent gave qualified answers. The principal reasons cited by the minority who condone the practice are (with the relative frequency of each reason indicated by the figure in parentheses): A man should have a free choice of unions (33); the practice strengthens the union (31); competition is good for unions (16).

The two principal reasons why employees who oppose the practice view it with disfavor are: An employee should be represented by the union of his own craft—each craft has its own problems (47); union rivalry for members "causes friction", "destroys unity" (16).

There was not a great deal of difference among the five principal classes of employees on this question. The "officers and clerks" category voted 60 per cent that for

one union to try to seek to attract members away from another union is "not all right"; 59 per cent of maintenance of way employees also voted this way; 56 per cent of train and yard crews were against the practice, as were 53 per cent of shop and stores employees and 62 per cent of transportation employees (except train, engine and yard).

The divergence in opinion among groups of varying seniority was much wider. Employees of 9 years' service or less who opposed such union rivalry were 50 per cent of the total. As seniority increases, opposition to the practice mounts with employees of 35 years' service or more being 65 per cent in opposition. There is no significant difference in opinion from region to region except in the Far West, where opposition mounts to 67 per cent, as compared to 53-56 in the East, Midwest and South.

Attitude Toward the Patrons

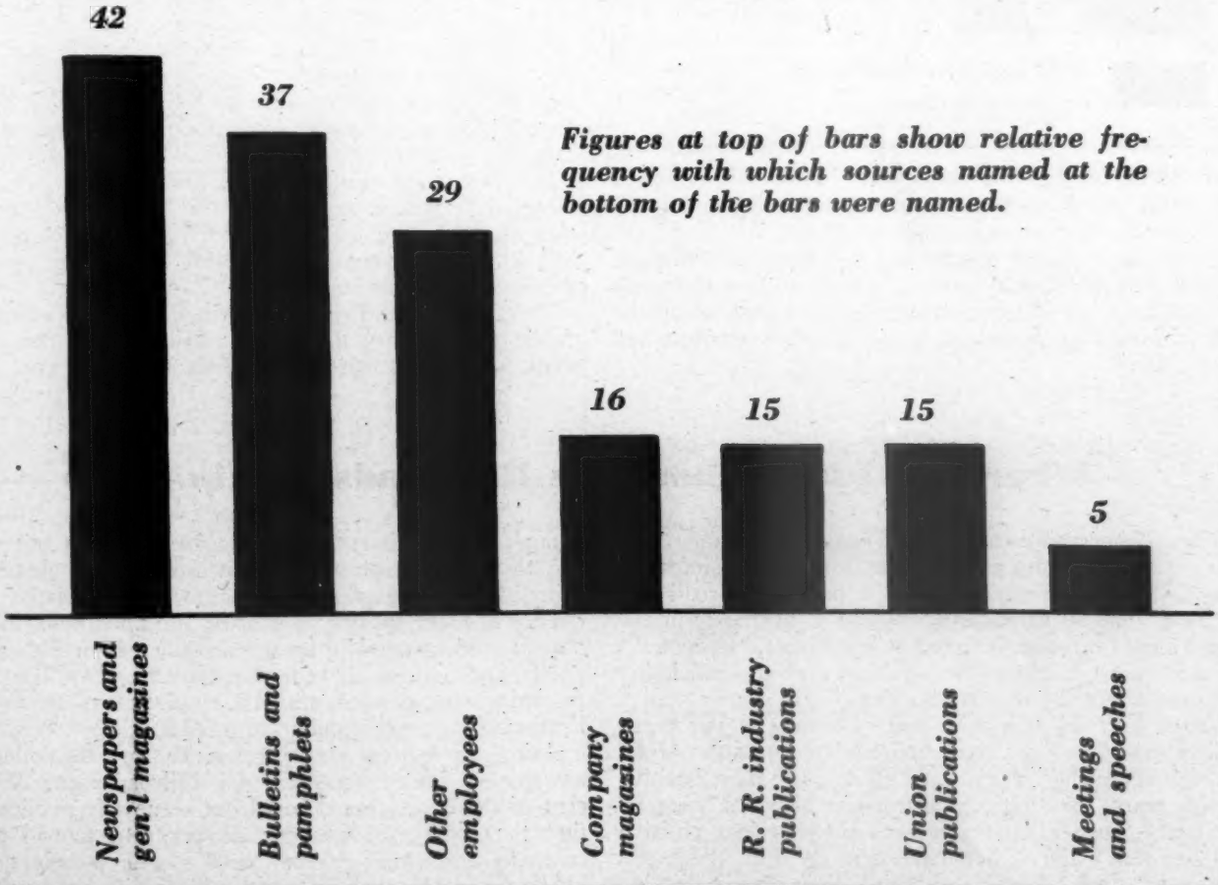
On the question of the railroads' service to patrons, 61 per cent of employees believe that shippers "are always treated with as much consideration as they should be" and 70 per cent say that passengers are always so treated. (It is significant, perhaps, to note that in the 1945 A. A. R. survey of public opinion, 41 per cent of recent travelers by rail said they had noted a let-down in the quality of service received at the hands of railway employees). Further on the subject of freight service, 25 per cent of the respondents do not believe that shippers are always treated with proper consideration, and 14 per cent express no opinion. As to passenger service, 24 per cent of employees believe passengers are not always treated with adequate consideration, while 6 per cent have no opinion.

On this question of service to patrons, there is no significant interdepartmental difference in the opinion of employees. There is, however, a marked difference in the opinions of groups of varying seniority—with the "old heads" being more satisfied than the younger ones. For example, only 52 per cent of employees with less than three years' seniority are satisfied with the quality of service to shippers, while 73 per cent of those with 35 years or more believe the shippers are receiving all the consideration they have coming to them. As to passenger service, 62 per cent of the lowest seniority group (less than three years' service) believe patrons are as well treated as they deserve to be, while 77 per cent of those with 35 or more years of service are satisfied with treatment accorded to travelers.

There are noteworthy differences on this question, also, as between territories. In the East 68 per cent of em-

Sources of Employee Information

Respondents were asked to name the principal sources of their information about the railroad industry, and their own company, and this chart portrays their answers.



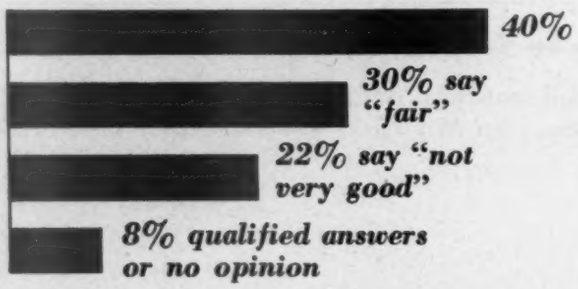
ployees believe shippers are sufficiently well treated, with only 54 per cent of employees in the South holding this view—with employees in the Midwest and Far West occupying a position midway between the two extremes. As for passenger traffic, it is again the East which shows the highest ratio of employee approval of existing treatment of customers. The ratio is 76 per cent. In the South it is 72 per cent, in the Midwest 68 per cent, and in the Far West 59 per cent.

These ratios, of course, do not necessarily evidence a greater degree of complacency among employees in one territory than in another, because it might well be that there is some absolute variation in the quality of service among territories—especially as traffic may be more congested in one area than in another.

Employees were asked whether they believe that treatment of patrons can be left to the discretion of employees or whether, on the other hand, special rules are needed for employees' guidance. Only 28 per cent feel that special rules are unnecessary; 47 per cent believe such rules *are* required; and an additional 19 per cent say that both rules

Chances of Promotion

Asked what they think of the chances of promotion in railroad work, 40 per cent of employees say the chances are good.

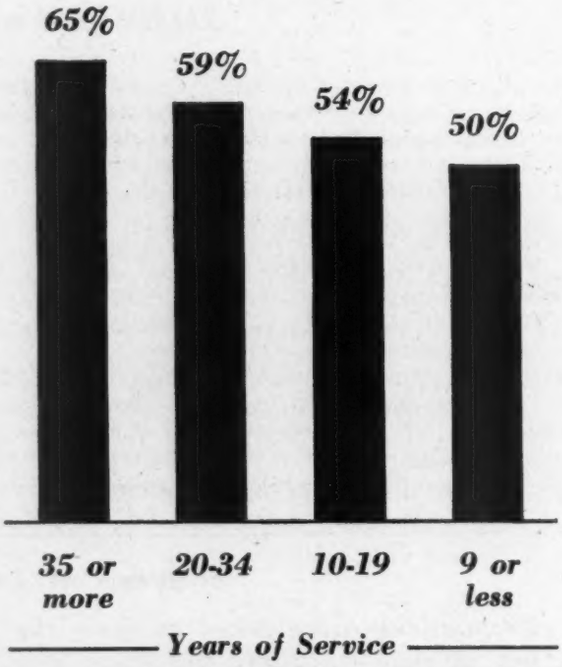


and the exercise of the employees' individual judgment are called for. Only 6 per cent of the respondents qualified their answers or expressed no opinion.

Respondents were then asked whether the railroads should provide "special training schools on how to handle the public", and 63 per cent expressed themselves in the affirmative; 29 per cent said "no"; and 8 per cent had no opinion.

Inter-Union Rivalry Not Favored

Percentages by which groups of varying years of service declare themselves opposed to a union's seeking to take members away from another union.



On the question of whether or not special training schools are needed to teach employees how to deal with the public, the category of "officials and clerks" came in with the highest ratio of affirmation (69 per cent). Train, engine and yard crews were the lowest occupational category in their approval of such instruction (58 per cent affirmative). Employees of low seniority are more receptive to this schooling than the "old heads" (66 per cent of those with less than three years' service approving, while 58 per cent of those with 35 or more years of service endorse the suggestion).

Territorially, the ratios favoring formal schooling in public contacts are as follows: Midwest 60 per cent; south 62 per cent; east 63 per cent; far west 69 per cent.

Where Do Ideas About the Railroads Originate?

The Opinion Research Corporation concludes that there is evidence of a considerable degree of misinformation or lack of information on the part of railroad employees. "One of the biggest problems to overcome in any educational campaign directed at employees," it says, "is the belief most of them now have that they are sufficiently informed about the railroad business."

Three railroad employees out of four (73 per cent) believe that they now receive enough information about the railroads. The "officials and clerks" are most positive on this point, their ratio of affirmative answers being 86 per cent. New employees were somewhat less positive (64 per cent) and so were those in the Far West (63 per cent). Only 22 per cent think they do not receive enough information; 5 per cent are in doubt about it.

The principal sources of their information about the railroads which employees name (with the relative frequency of mention of each source) are as follows: newspapers and general magazines (42); bulletins, pamphlets, and notices (37); fellow workers (29); company magazines and newspapers (16); railroad industry publications (15); union publications (15).

Asked to express their preference for magazines or newspapers issued especially for railroad men, 27 per cent of those questioned could not name any publication that they particularly liked; 23 per cent named their company magazine; 16 per cent specified their union publication; 11 per cent mentioned specific craft maga-

zines (having in mind, presumably, such departmental publications as Railway Mechanical Engineer or Railway Engineering & Maintenance); Railway Age was named by 9 per cent. Since Railway Age does not circulate to any extent among railway employees in the ranks, its mention by as high a percentage of employees as this appears larger than might reasonably be expected.

The Survey Plan

This Opinion Research Corporation's survey of railroad employee opinion is based on a total of 1309 personal interviews with a representative cross-section of all types of railroad workers, with the exception of section hands and gang laborers who were purposely excluded from the survey. This exclusion was made because of language and other difficulties which, it was expected, would be encountered in interviewing a large proportion of these laborers; and on two assumptions, viz., (1) that many of these employees were war-time acquisitions with only limited opportunity, as yet, to form definite convictions about railroad work and (2) that, where these employees had concrete opinions about the railroad business, there was no reason to suspect that such opinions would be materially different from those of other employees. In short, it was believed that a reliable cross-section of employee opinion could be secured with the omission of these employees and, since their inclusion would have been difficult and expensive, they were omitted.

Interstate Commerce Commission wage statistics bulletins and data from the Bureau of the Census were used as guides in determining the correct proportions of the different classifications of employees to interview and the localities in which to do the interviewing.

Interviewing was confined to counties which in April, 1940, had either (a) 4 per cent or more of their male-worker population employed in railroad work or (b) more than 1000 male railroad workers. Such counties, although numbering less than 600 of the 3070 U. S. county total, included about 78 per cent of all railroad employees in the country. Consequently, it was possible at a considerable saving of time and expense to select the sample in places having some concentration of railroad employees, while maintaining a reasonably complete coverage.

If a sample is to reflect accurately the views of the total population, it must have the same proportion of old and young, office workers and shop workers, etc., as the total population. The following table compares the sample and the total population it is meant to represent. It will be noted that the two coincide closely.

Groups of employees	Per cent each class is of sample	Per cent each class is of total r.r. employees
Officials and clerks	17	15
Way and structure workers	9	8
Shop and stores workers	32	34
Train and yard crews	30	29
Other transportation workers	12	14
Under 45 years of age	47	50
45 years and over	53	50
East	32	34
Midwest	35	36
South	17	18
Far West	16	12

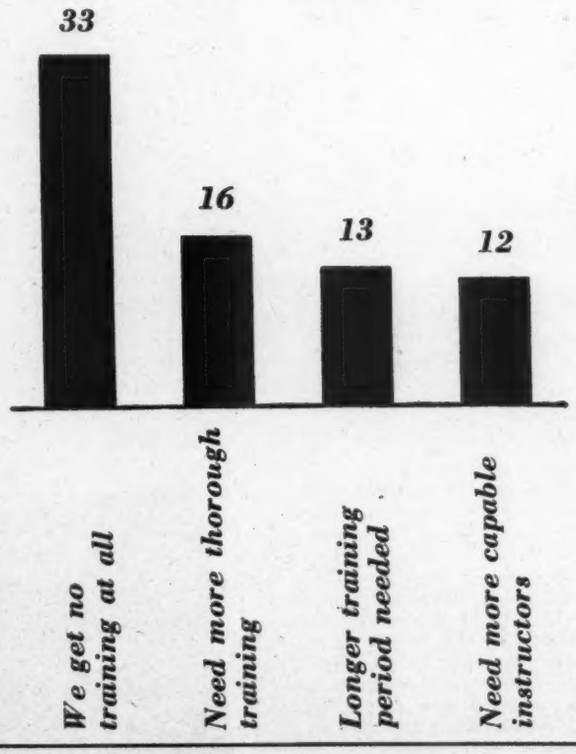
Every survey based on less than 100 per cent enumeration of the population under study is subject to a certain error due to the size of the sample. This error, however, can be calculated by standard methods.

For example, in this survey 89 per cent of the total respondents say that the railroads did the best war-time job of transportation that they could have done. In a sample of this size (1,309 cases), based on a representative cross-section, the chances are 99 out of 100 that any error due to size of sample would not exceed 3.3 per cent. In other words, if all railroad workers in the United States in the classifications under consideration were to be interviewed, those believing that the railroads did the best possible war-time job would almost certainly comprise between 87 per cent and 91 per cent.

For practical purposes, therefore, it can be stated that the sample is of adequate size, and the taking of additional cases would not have changed the results to any significant degree.

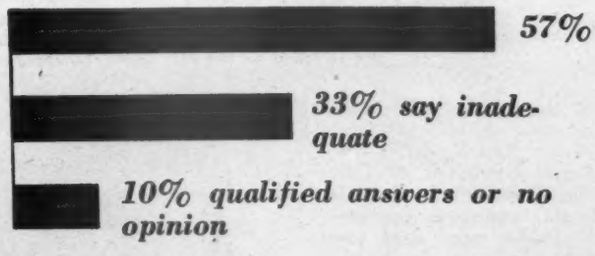
How Training Could be Improved

Suggestions were asked from those who say present arrangements are inadequate —figures at top of bars indicate relative frequency of the principal recommendations.



Opinions on Job Training

57% of employees say present provisions for training employees for their jobs are adequate.



B. & O. Machinery Replacement

THE heavy repair shops and the enginehouses have been hampered in their efforts to maintain the larger and precision-built locomotives and cars constructed during the last decade because of the inadequate and obsolete design of many of the machine tools with which they were equipped. A thorough study was made of this situation on the Baltimore & Ohio by the shop practice bureau, motive power department, and recommendations were made by the general superintendent motive power and equipment to the management regarding a program for the purchase of new machinery to replace the older equipment that was obsolete in design and otherwise unsatisfactory. This program was approved and an expenditure of $2,582,730 was authorized for the years 1944 to 1946, inclusive. Many machines were purchased and installed during 1944 and 1945. They had features such as individual motor drive, hydraulic and push-button control, and selective speeds and feeds which tend to reduce the manual effort required to operate the machines. Being designed for the job for which they are intended, they operate more efficiently and their greater output results in economical amortization periods.

Heavy repair shops were given primary consideration in the replacement program. The old machines replaced in these shops, if they were of suitable design and in good condition, were transferred to less important repair shops to replace older and less efficient equipment and thereby made possible more satisfactory and economical operation at the smaller repair points. Those machines which had outlived their usefulness were scrapped.

On this and the following pages are presented a list of the machinery ordered by the Baltimore & Ohio during 1945, illustrations of some of the equipment, and the available data on the performance of the items illustrated.

Machine Tools and Equipment Ordered in 1945 by the Baltimore & Ohio

Machine	Number	Machine	Number	Machine	Number
2 ton electric hoist	3	30-in. by 120-in. gap grinder	1	48-in. by 138-in. trailer trucks	48
1½-ton electric hoist	1	No. 4 Kling punch and shear	1	Clartor 6 tractors	4
1-ton left-hand crane	1	3-in. by 48-in. vertical miller	1	10-gauge by 10-ft. power brake	1
6-ton electric hoist	1	52-in. Turchan follower-mill, mach.	1	312 cu.ft. per min. air compressor	1
3-ton crane outrigger	3	90-in. driving wheel lathe	1	412 cu.ft. per min. air compressor	4
5-ton tractor and roustabout crane	3	36-in. Bullard vertical turret lathe	2	312 cu.ft. per min. air compressor	2
36-in. ready power unit	5	42-in. Bullard vertical turret lathe	1	187 cu.ft. per min. air compressor	1
400-amp. welder and charger	1	2-in. No. 4 Warner & Swasey turret lathe	1	850 cu.ft. per min. air compressor	2
30-in. cylinder and valve boring bar	5	18-in. engine lathe	1	200-gal. pumps	5
300-lb. Bradley hammer	1	20-in. engine lathe	1	200-gal. pumps	2
100-ton hydraulic spring stripper	2	36-in. Ohio heavy-duty shaper	1	Ash conveyors	3
100-ton hyd. equip. for banding press	1	36-in. by 36-in. by 10-in. planer	1	50-ton drop-pit table	1
6-in. by 6-in. power machine saws	5	90-in. journal truing attachment	1	Rag washing machine	1
6-in. DeWalt saw	1	21-in. engine lathe	2	150-hp., 150-lb.-per-sq.-in. No. 168 Economic stationary fire-tube boiler	2
100-ton hyd. cyl. and valve bushing press	1	⅜-in. drill press, four-spindle	1	300-hp., 200-lb.-per-sq.-in. H-111 No. 17 water-tube stationary boiler	2
2½-in. by 6-in. flue-cleaning sand Rotoblast	1	¾-in. drill press	1	8-ft. 6-in. by 9 ft. ⅜-in. underfeed, side-dump, single-retort stokers	2
26-in. friction cut-off saw	2	3-in. drill press, two-spindle	1	5-ft. 6-in. by 6-ft. 6-in. 6-C-66 underfeed, side-dump, single retort stokers	2
2½-in. by 6-in. flash welding machine	1	24-in. by 24-in. woodworking shapers	2	60,000-lb.-per-hr. non-deaerating vertical type feedwater heaters	4
½-in. flash welding machine	1	300-lb. double rated acetylene generators	3		
36-in. conveyor unit	1	600-ton wheel press	1		
AB brake test racks	2	36-in. by 12-ft. heat-treating furnace	1		
¼-in. by 3-in. drill grinders	5	300-ton bulldozer	1		
0-in. by ¾-in. drill grinders	3	4-in. billet shear	1		

(1) Airco No. 41 Travograph for eight-torch multiple operation, complete with work and tracing tables, installed at Cumberland, Md., bolt and forge shop—It replaced two Oxygraph cutting machines of obsolete design—(2) Monarch Model NN engine lathe for machining piston rods at Cumberland, Md. locomotive heavy-repair shop—Lathe has 30-in. by 14-ft. capacity with 16 speeds, six to 303 r.p.m., and 48 feed changes—It replaced a 24-in. by 12-ft. engine lathe—(3) Three-inch Acme Model XN upsetting, heading and forging machine at Cumberland bolt and forge shop replaced 1-in. and 2½-in. obsolete forging machines—(4) No. 3A Warner & Swasey Universal hollow hexagon turret lathe with 23½-in. swing and 4½-in. by 44¼-in. bar capacity replaced old style No. 3A turret lathe at Mt. Clare, Md. automatic shop—(5) Betts-Bridgeford 45-in. by 9-ft. 3-in. journal truing lathe replaced obsolete 33-in. machine at Washington, Ind. wheel shop—Lathe is double-end gap type with each carriage equipped with opposed-type burnishing attachment and has three speed- and four feed-changes—Machines of this type were also installed in the Mt. Clare, Cumberland and Glenwood wheel shops

(6) No. 567 and 567A boring bar made by Electro-Motive Division, General Motors Corporation, installed at Mt. Clare shops for boring lower decks of Diesel locomotive engines—(7) Do-All metal band saw, Model V-26 at Cumberland bolt and forge shop has 26-in. throat depth, 12-in. work thickness capacity, automatic power feed, and illuminated magnifying attachment—(8) Chambersburg 750-lb. motor-driven pneumatic forging hammer replaced two 300-lb. obsolete hammers at Cumberland bolt and forge shop—The hammer has 27-in. stroke, 11½-in. by 5½-in. die surface and a speed of 125 blows per minute—(9) Two King 52-in. heavy-duty vertical boring mills installed at Mt. Clare, Md. shop

Program

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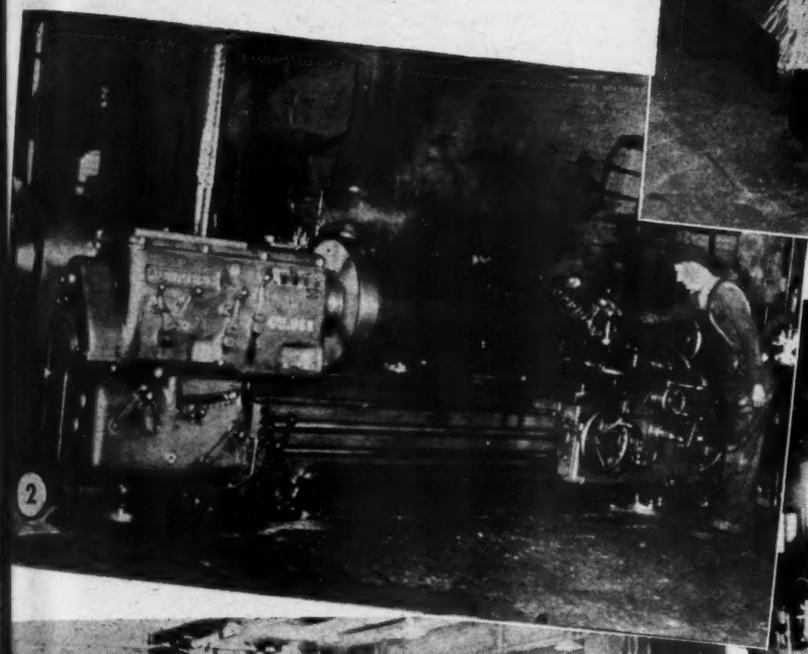

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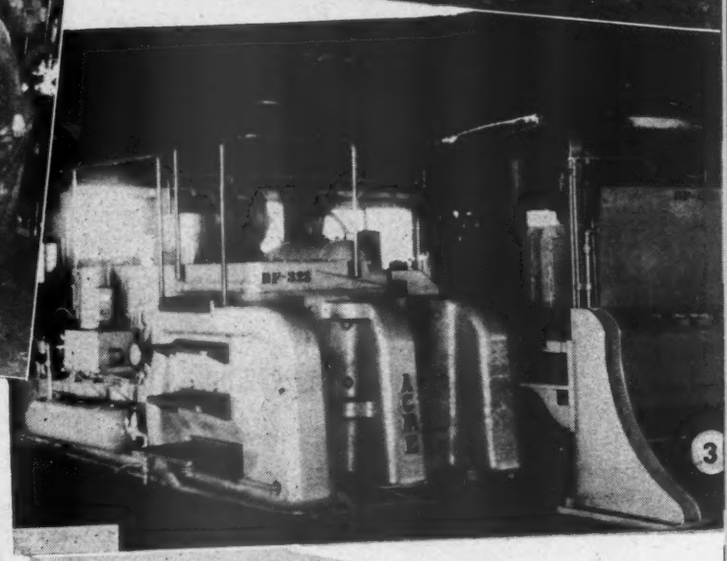

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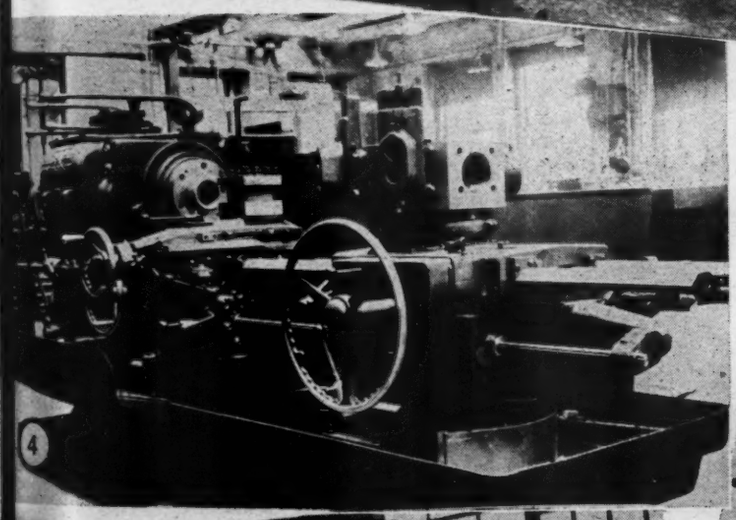

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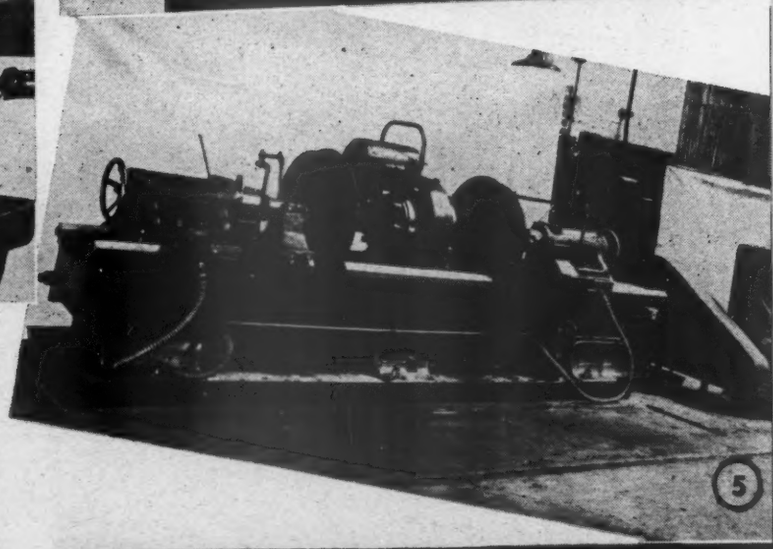

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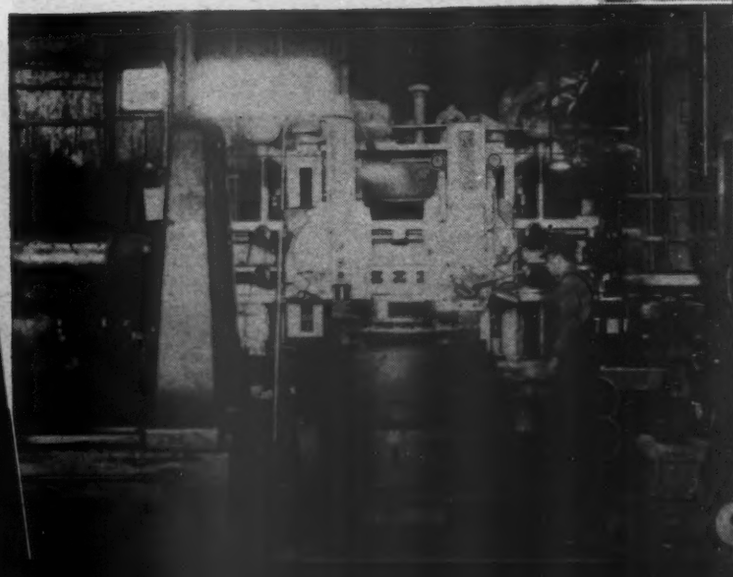
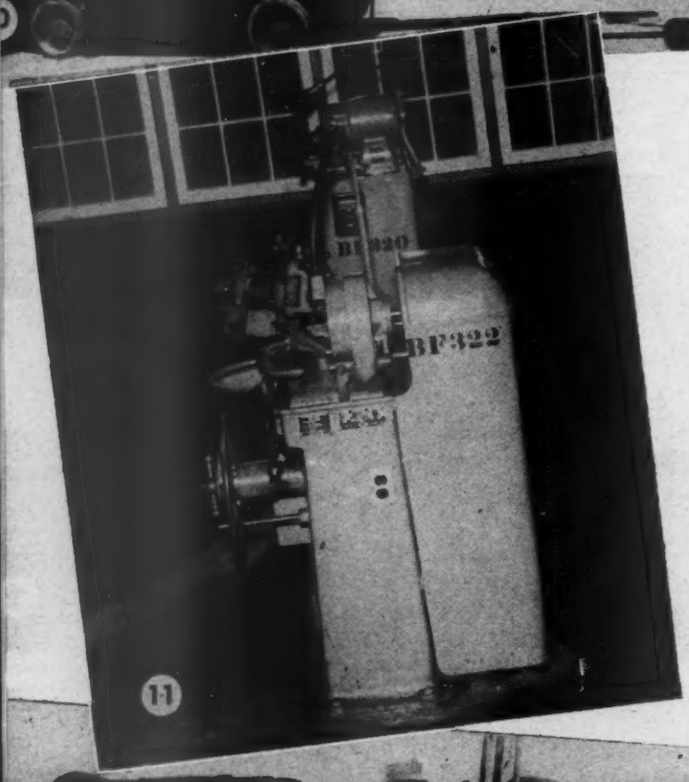




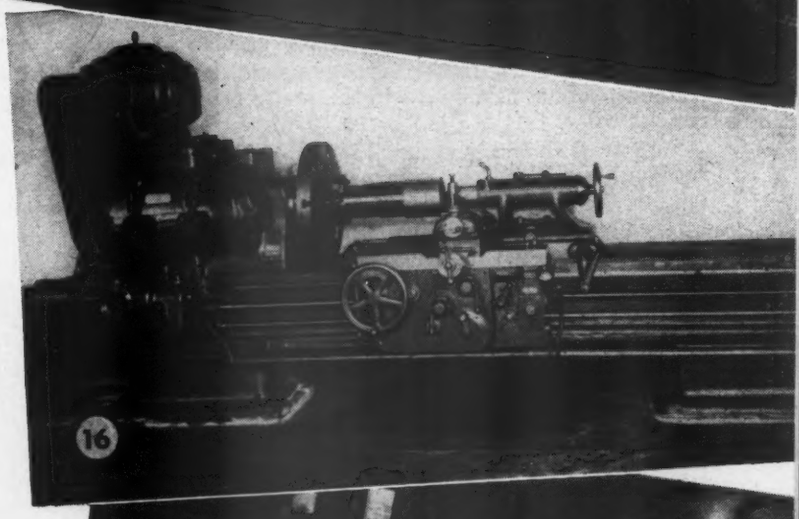
New Machine Tool vs. Old Machines—

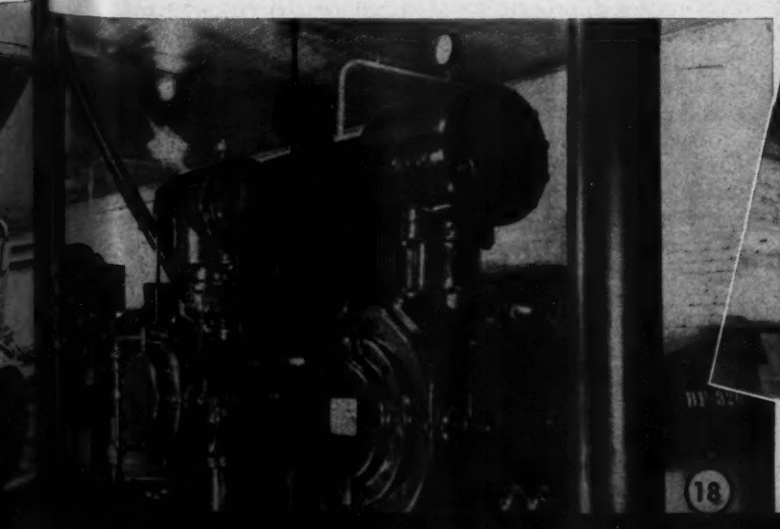
Illustration No.	Machine Tool	Operation
1	Travograph	Cutting: Circular liners Brake levers Coupler wear plates Barber roller spring seats and caps
2	30-in. by 14-in. engine lathe	Turning new piston rods Refitting piston rods
3	3-in. forging machine	Forging: Loop hangers Spring rigging pins Crosstie braces Slack adjuster screws
4	No. 3A turret lathe	Machining and threading: Whistle elbows Speed bushings Steel speeds
5	45-in. by 9½-in. journal truing lathe	Truing axle journals with wheels mounted (pairs)
7	Metal-cutting saw	Cutting out: Spring hanger header 4½-in. rubbing dies Radius shear blades Nibbing dies
8	Pneumatic forging hammer	Forging: Sword spring hanger Driver-brake posts Grate-shaker fulcrums
9	52-in. vertical boring mill	Facing: cylinder-head joints Machining: Truck cradles Truck boxes
11	Drill grinders	Regrinding: 7/32-in. to ¾-in. drills 7/16-in. to 2½-in. drills
12	90-in. wheel lathe	Turning: Tires mounted on wheels (pairs)
15	100-in. boring mill	Boring: Driving-wheel tires
16	24-in. by 72-in. engine lathes	Turning: New locomotive axles Crank pins from billets
19	Axle lathe	Turning: New 5-in. by 9-in. axles Second-hand 5½-in. by 10-in. axles New 6½-in. by 12-in. axles
non ill.	6-ft. radial drill	Drilling: Crossheads Side rods Binders Guide bars

(10) Yale & Towne three-ton crane truck, Model K-42-SH-6-7-78, equipped with Ready Power unit at Mt. Clare, Md.; Glenwood, Pa.; Grafton, W. Va.; Ivorydale, Ohio, and Washington, Ind., locomotive shops for handling heavy locomotive material—(11) Sellers No. 1G and No. 6G self-contained pedestal-type drill grinders with built-in motor and coolant system—These grinders of up to 5/16-in. and 5/16-in. to 3-in. capacities replaced old-style grinders at Mt. Clare, Md.; Cumberland; Glenwood, Pa., DuBois and Ivorydale, Ohio, locomotive heavy-repair shops—Operation: regrinding drills up to 3 in. in diameter—(12) Niles 90-in. heavy-duty driving-wheel lathe at Glenwood locomotive heavy-repair machine shop replaced old style 90-in. wheel lathe transferred to enginehouse at another point—(13) Yale & Towne, Model K-42 G-10, five-ton crane truck with Ready Power unit installed at Philadelphia, Pa., and Willard, Ohio, Diesel shops for handling Diesel traction motors and generators—(14) Portable gas-engine-driven d.c. electric arc-welding machine of 300-amp. capacity mounted on rail car used at Glenwood, Pa., heavy repair car shops—Portable gas-engine-driven welders are also located at Mt. Clare, Md.; Brunswick; Lorain, Ohio, and Chillicothe heavy car-repair shops for welding miscellaneous car parts

Comparison of Machine Tools Illustrated

	No. of pieces	Man-Hours Required: Old Machine	Man-Hours Required: New Machine
.....	571	168	89
.....	736	92	49
.....	502	56	29
.....	1,188	86	45
.....	19	244	76
.....	26	104	39
.....	1,000	117	87
.....	1,000	48	32
.....	1,000	64	48
.....	1,000	57	40
.....	27	36	24
.....	357	40	32
.....	200	60	38
.....	178	360	117
.....	1	4½	1
.....	1	2 1/8	1/8
.....	1	1½	½
.....	1	2 1/8	1/8
.....	100	46	19
.....	100	120	60
.....	100	80	40
.....	22	22	12
.....	9	45	23
.....	14	25	14
.....	500	33	13
.....	6,400	430	215
.....	64	161	73
.....	31	32	7½
.....	2	28	20
.....	4	20	12
.....	18	56	8
.....	36	48	18
.....	12	32	8
.....	4	5	2
.....	3	5	3
.....	6	6	4
.....	8	5	5





(15) Betts 100-in. boring mill installed in Mt. Clare machine shop—It is a heavy-duty vertical boring and turning mill with power rapid traverse of head saddles and tool arms and is used for boring locomotive tires, etc.—(16) Boye & Emmes 24-in. by 72-in. engine lathe installed in DuBois locomotive heavy-repair machine shop for machining crank pins, etc.—(17) Portable d.c. electric arc-welding machines of 400-amp. capacity, manufactured by General Electric, Lincoln, Westinghouse, Harnishfeger, Wilson, and Hobart, installed in various heavy repair shops and enginehouses during current machinery replacement program for miscellaneous welding of car and locomotive parts—(18) Air compressors installed at Cumberland bolt and forge shop—The two air compressors of 671 cu. ft. per min. capacity, complete with aftercoolers, one an Ingersoll-Rand 15½-in. by 9½-in. by 10-in., style XRE, and the other a Worthington 15½-in. by 9¾-in. by 10-in., style DC-2, replaced two 300-cu.-ft.-per-min. machines, which were transferred to smaller stations—They supply compressed air for the Cumberland bolt and forge shop, rolling mill, west-bound transportation yards and the car-repair tracks—(19) Niles No. 3 axle lathe installed at Mt. Clare, Md., wheel shop—Replacing an obsolete axle lathe

German Development of

Locomotives and Cars*

Development restricted mainly to production methods because of lack of skilled labor and priority given to war materiel

It may come as a surprise to the many who accepted German technical development as a foregone conclusion, that much which follows is negative as to such development. However, it at least provides the answer to many of the questions raised by men interested in railways and their associated and allied industries. In reviewing and digesting the information, it is concluded that a number of interesting and novel war-pressure developments are evident, but there is nothing wholly revolutionary and little that is even technically advanced. While the Deutsche Reichsbahn† was a well-knit system capable of high volume transportation, the equipment, facilities, and methods were at best conventional and in many instances antiquated.

Improved methods of building conventional types of equipment received the only particular development attention. Even this development was largely influenced by the necessity of using unskilled non-German (enforced foreign) labor, the ratio of unskilled to skilled labor in some of the sub-departments being eight to one. Out of this forced activity came some interesting fabrication methods.

Steam Locomotives

The steam locomotive remains by far the greatest source of motive power although there are extensive electrified operations located in Germany. Many experimental types of steam locomotives were built in the past 25 years. In 1924 Krupp built a direct-drive steam-turbine Pacific-type locomotive for express service on the DRB. It was not successful and the detailed information has been available in the United States for many years. German engineers commented that it had been impossible successfully to use the direct drive and, further, that the water consumption was highly excessive.

In 1928 a 2-10-0 freight locomotive to burn powdered coal was installed. It failed to meet design expectations. The fuel loss through the stack was so high as to render it inefficient. In 1929 to 1930, a high-pressure 4-6-2 express locomotive was constructed by Loffler-Schwarzkopff. The operating pressures exceeded 1,700 lb. per sq. in. and it likewise was impractical. The performance did not justify continuing it in service.

A further novel development that pre-dates the war are the condensing locomotives built by Henschel and Sons of Kassel. These are all two-cylinder, 2-10-0 locomotives. The first was built in 1931 for the Argentine State Railway. In 1933, another was built for the Russian Railways. In 1936, six more were built for the Argentine and in 1939 a condenser-equipped tender was built for the Iraq State Railway. Immediately preceding the war a considerable number were built primarily for operation in the east and these have operated throughout the war.

This locomotive has a steam turbine placed near the top of the smokebox which drives a draft fan. Exhaust steam from the cylinders powers the turbine and then flows through a pipe to the condensers on the tender. Three fans on the tender draw cooling air over the two condenser radiators placed vertically along each side of the tender. The turbine rotating these fans uses the exhaust steam from the smokebox turbine and then exhausts it into the condenser.

Several claims were made for the performance of the condensing locomotive, one of 1,200 miles without requiring water replenishment. A better figure, and one supported by authorities, is 700 miles. A number of them are now being operated by the Military Railway Service, Army Transportation Corps, for service performance data and this information will be available from that source at a future date.

German comment was not favorable. It would indicate that they considered the arrangement only justified where water was most scarce or highly contaminated. One of the DRB officers commented that the two fan turbines adversely affected the efficiency of the locomotive and that the device was impractical, difficult to operate properly, and persistently required excessive maintenance. One advantage of the locomotive was that no steam was exhausted to the atmosphere and, therefore, the locomotive was not so readily located by airplane or artillery observers.

In more recent years the tendency has been toward the conventional steam locomotive with force-feed lubrication and feedwater heating but continuing hand firing. The standardized war-time locomotive was a 2-10-0 type without feedwater heating. Both two-cylinder and three-cylinder engines have been built but many of the third-cylinder chambers have been blocked and the rod left off. Most recently only the two-cylinder locomotive has been constructed.

The substitution of steel for copper in firebox sheets and staybolts, a war necessity, has now convinced the German railroad people of the superiority of steel for these purposes and steel will remain the standard application.

An interesting feature was developed in connection with the investigation of locomotive builders. At Maschinenfabrik Esslingen, Wurttenberg, the war-time standardized locomotive was being built with 8,000 man-hours and that included processing of much of the material and parts. This represents a reduction, according to the plant officers, from a previous requirement of 22,000 man-hours. During the period of greatest construction and, in fact, until a few days before the capitulation most of the workers were impressed foreign workers (non-German in the language of the German officers). These workers had little or no skill. To meet this condition many operations considered skilled were so set up as to eliminate the skill requirement. At the same time material fabrication was devised to minimize processing operation that involved skill. For example, cylinders and valve chambers were bored using a tool head that fixed the bore diameter without frequent skilled adjustment. The tool bits for the first pass, or roughing cut, were

* Abstract of report entitled, "German Railroad Technical Development," released by the Office of Publication Board, Department of Commerce, Washington, D. C.

† German State Railway, abbreviated DRB.

fixed in the head. When the horizontal boring bar was withdrawn after the first pass, four tool bits for the finishing bore were extended to the proper cutting position by the simple tripping of small levers. The second pass finished the bore.

This same principle was followed in much of the drilling and machine work, using templates, jigs and fixtures to eliminate layout, calipering, and measuring. In short, it was an intensified adaptation of the principle of the mass production methods used in our automobile industry to locomotive building. Flame cutting to template and stack flame cutting were extensively used and the cut surface was not subsequently machined. Brake hangers, brake levers, spring hangers, spring equalizers, and similar parts were flame cut and all forging or machining eliminated.

Main and side rods were made from drop-forged heads and an I-section rolled bar, welded electrically under pressure. A Siemens welding machine with pressure and current controls was used. The current was passed through the sections to be welded and when the proper temperature was reached, butt welding was effected by pressing the sections together mechanically. Here again the forging requirement was limited to the drop (mechanical) operation on the rod heads. No machining was required between or on the heads, leaving only the bore for the bushing to be machined.

The mud ring was made of eight pieces. The sides and ends were of bar stock rolled to finished size. The four corner sections were flame cut to template and the complete ring formed by manual electric arc welding in a rotating jig that permitted down-hand welding on all sides.

The mud ring, firebox and boiler sheets, waist sheets, and dome were all drilled through bushed templates, eliminating layout, with the sheets or assembly so held in adjustable jigs that the section being drilled was always held in proper relation to the drill spindle. In connection with the over-all man-hour requirement for construction of the locomotive, that for the boiler complete was 1,600, a reduction from a former requirement of 4,000 man-hours.

The tender is of all-welded construction without underframe and with two pressed-steel built-up four-wheel trucks. The tender capacity is 11 tons of coal and 8,000 gals. of water.

The locomotive, as a finished product, is well assembled and the service performance under the Military Railways Service has demonstrated its utility.

Other Motive Power

The use of Diesel motive power is comparatively limited and the better installations have been made in two- and three-car articulated trains. A considerable number of Diesel switch engines are in use but these are small and nearly all of them are mechanically driven through a transmission and sprocket chains. Hydraulic drives with Diesel power have been introduced experimentally to a limited extent. Diesel-electric motive power is by no means advanced in development. Gas generation for Diesel motive power was experimentally used around Stuttgart but the development did not progress satisfactorily. Here again such development was adversely affected by the prime devotion to making war. Internal-combustion-power research personnel and facilities as well as the manufacturing capacity were devoted to development and production of power for planes, marine vessels, road transport, armored vehicles, flying bombs, and similar powered implements of war.

No combustion gas turbines have been used as prime power for locomotives. The only known application of this type is that on the Swiss Federated Railways which was constructed by Brown, Boveri at Baden, Switzerland. No advance in this development has been reported in the past 18 months or since its presentation, about then, to the American Society of Mechanical Engineers at New York.

No new or novel electric locomotive designs have been developed. As described by one American authority the best to be found in Germany is not superior to the locomotives considered obsolete on electrified American roads.

Car Development

In the German passenger car there is nothing technically advanced except that here again welding as a fabricating medium is used increasingly to accomplish weight reduction, material economy, and a lessened construction man-power requirement on both the body and the trucks. The articulated two- and three-car units are comfortably appointed but have nothing outstanding. The conventional passenger-train cars are not at all remarkable in this regard. Many of the cars are equipped for electric heating from a head-end power source. But, all such cars seen, and all of the record data obtained, shows them also equipped for hot water or steam heating. The modern American passenger car is superior in conception, layout and appointment.

Two of the special trains identified with certain high placed personages of the Nazi organization were examined. They are comfortably, even ornately appointed and equipped. Again, there are many American cars that meet all of the requirements of comfort and pleasing atmosphere without the excesses of these near monstrosities.

There are several novel designs of freight cars, many especially adapted to particular commodities and with specialized loading and unloading arrangements. These include (1) A bunker or container car for the transportation of processed coal; (2) a car for hauling powdered fuel, equipped with three tank-like sections completely enclosed with a tightly closing hatch and designed for self-clearing through small bottom discharge openings, and (3) a closed hopper car for grain transport fitted for hatch loading and chute discharge.

A radical development is a 16,000-gal. tank car of arc-welded construction without an underframe and with four-wheel, built-up arc-welded steel trucks. The tank is 32 ft. 6½ in. long over heads with a 9½ ft. inside diameter and is equipped with two baffle plates equally spaced from the ends. These cars have been in service in most of the countries of Western Europe and all reports would indicate satisfactory service, with some few instances of head failures.

Arc welding has been generally used in freight-car construction, both for body and truck fabrication. Material economy, reduction in weight, and decreased man-hour requirement, are the influencing factors.

Brakes and Couplers

There are few cars equipped with automatic couplers. Such as have been applied are on passenger cars in the Berlin and Hamburg areas and include air and electric connections. These latter have not been entirely satisfactory and frequent service failures occur. The locomotive and train braking system are quite antedated and little if any development attention is indicated. The older types of air brakes are in general use.

Journal Bearings

Most of the locomotives and cars are equipped with bronze or bronze white-metal-lined bearings. The locomotives are equipped with oil-lubricated driver bearings.

(*Continued on page 192*)

New York Central Develops

"Smoke-and-Odor" Hot-Box Alarm

Detector cartridges, first tried experimentally in 1933, have been under continuous trial and evolution since—Present program of service installations involves more than 35,000 bearings

After a period of development and testing which has been in progress since 1933, the New York Central has evolved a practical hot-box alarm which it has now programmed for general installation on its passenger rolling stock and locomotives. The alarm system employs two indications—smoke for observation outside the train and to identify the over-heated box, and a distinctive and unpleasant odor which conveys the message to the interior of the train. The alarm was designed primarily for application to friction bearings, but has been adapted to and is being installed in roller-bearing journal boxes.

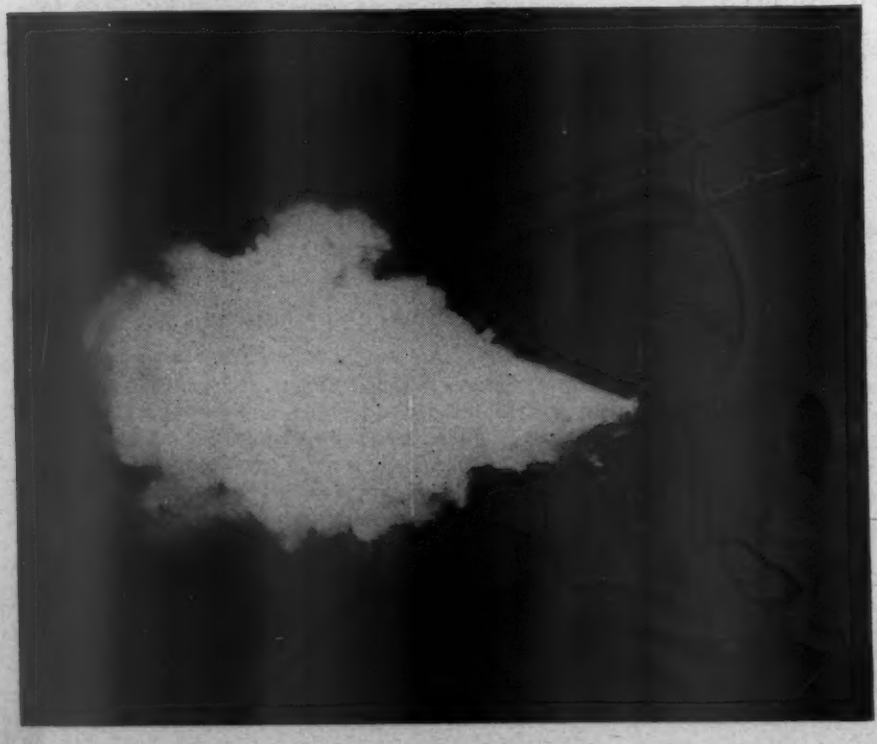
In its latest form this alarm consists essentially of two containers or "cartridges" which are placed in cavities provided in the bearing for that purpose. Each cartridge is filled with a different liquid and has a small orifice sealed with a fusible metal which melts at a pre-determined temperature and releases the liquid. At this temperature the liquid vaporizes as fast as it can escape through the orifice. The liquid from one cartridge produces a distinctive and penetrating odor and that from the other a dense white smoke, both of which give warning of an over-heated bearing. The discharge continues until both cartridges are empty, which requires from eight to ten minutes.

The liquid used to produce the odor is ethyl mercaptan and the smoke-producing liquid is a mixture of titanium tetrachloride and carbon tetrachloride. The gases from both of these liquids are non-corrosive and, when diffused in the atmosphere, can be inhaled without harmful effect. For the fusible element, the melting temperatures that have been found most satisfactory are 220 deg. F. for roller-bearing applications, 320 deg. F. for waste-packed friction bearings, and 450 deg. F. for grease-lubricated friction bearings. All three of these temperatures are substantially above the normal running temperatures of bearings of the respective types. Some years ago the New York Central conducted a series of tests which disclosed that carbon steel axles in the normal 40-55 carbon range are not adversely affected by temperatures up to 525 deg. F.

The cartridges for friction bearings are thin-wall brass tubes 5/8 in. in outside diameter. These tubes are of two lengths, 7 in. and 8 in. The shorter tubes are for 5-in. by 9-in. brasses and the longer ones for all other bearings. The ends of these tubes are fitted with brass cap seats, with inside taper threads, which are sweated in place. In the seat is screwed a fusible plug. The finding of a satisfactory closure of the tubes was one of the most difficult phases of the development of successful cartridges. The taper threads are 40 per in.

To distinguish readily between the two types of cartridges the plug for the odor cartridge has a hex head and that for the smoke cartridge, a square head. The head of each plug is also stamped with a number which indicates the melting temperature of the fusible metal with which it is filled. When loaded and plugged the cartridges are tested in hot water at 200 deg. F. for ten minutes to detect any lack of tightness in the closure.

The journal bearing is drilled longitudinally to provide

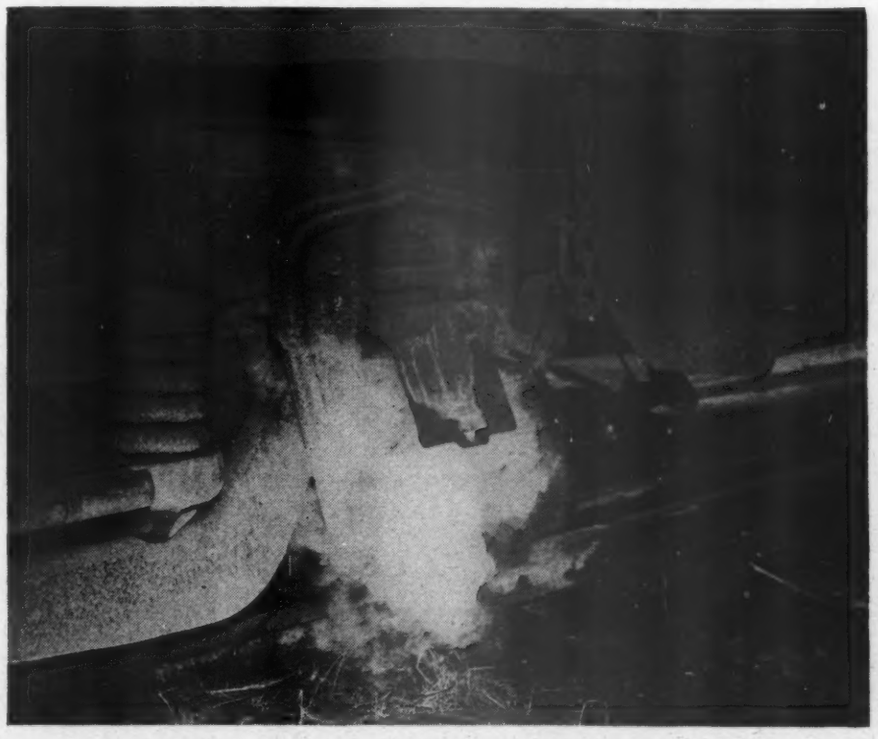


A cartridge in a tender roller-bearing journal box discharges a cloud of white smoke

cavities of suitable depth to receive the cartridges. These cavities are located just inside the sloping sides of the brass where the metal is thickest. The cartridges are retained in the brass by Hubbard expansion plugs (dished washers), which are pushed into shallow cylindrical countersinks at the ends of the cavities.

The loaded cartridges are placed in the bearing by the manufacturer and require no attention thereafter unless and until they are subsequently discharged by an overheated bearing, when, of course, they must be replaced.

The cartridges for roller-bearing boxes are formed of thin steel and are 1¼ in. in diameter by 1⅞ in. long, closed by a welded cover in the center of which is a fusible plug. These are inserted in pockets in the face of the roller-bearing housing. Ears which project out from the end of the cartridge fit into recesses in the face of the housing, in which they are secured by peening over the metal at the edges of the recesses.



Smoke from the friction-bearing cartridges discharges in the journal box—The characteristic white cloud is shown escaping from a passenger-car journal box

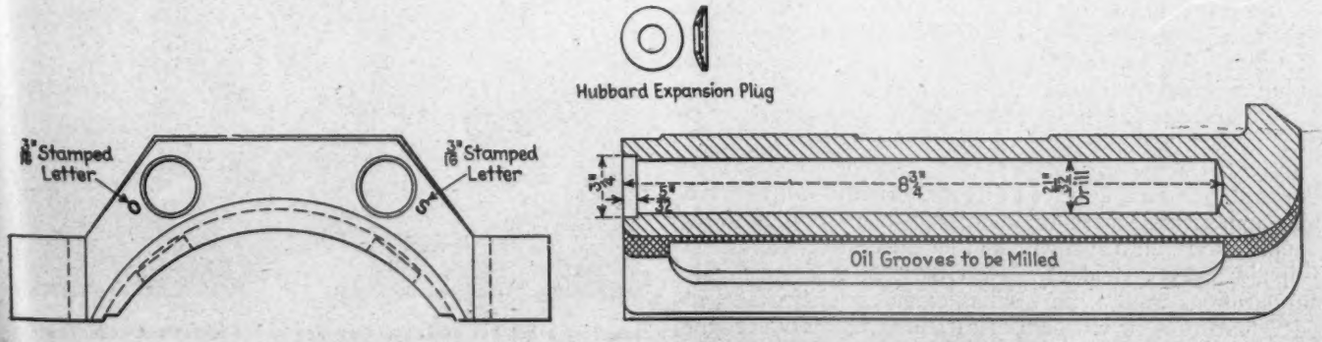
Early Tests

The first test in road service was made in August, 1933, on a branch line. For this test a dummy journal box was attached to the underframe of a Pacific type locomotive tender. Artificial heating was produced by an electric heater and small capsules containing the specified materials were thus discharged en route. Observers stationed in different cars of the train all reported that the odor was so strong that it could hardly have escaped attention by any member of the train crew. This test did not, however, represent main-line conditions, and the train included no air-conditioned cars.

On July 16, 1934, the first observations were made on a main-line revenue train. It was found that the odor from the alarm was plainly noticeable in both air-conditioned and non-air-conditioned cars. This was still not considered conclusive, however, because the container used to represent the journal box was well ventilated, a condition favorable for the escape of gases.

On August 9, 1934, a third series of main-line tests was made. In these tests a standard journal box equipped with an articulated lid was suspended as before underneath the tender. The journal-box lid was of the ventilated type but tests were made also with the ventilators tightly plugged, so that conditions simulated those in service with the tightest known friction journal box. Evidence of the effectiveness of the "smoke," as well as the odor, of this alarm was developed unexpectedly during these tests when the train was stopped by a tower man because he saw the smoke of a "hot box" and did not know that it was artificially created.

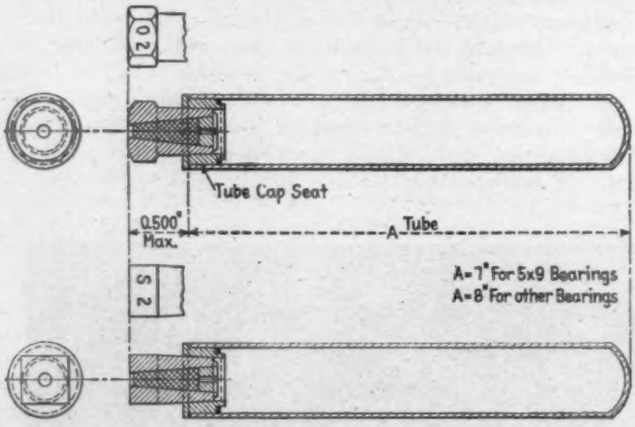
These three tests established beyond question the fact that the odor of the hot-box alarm is strong enough so



The cartridges are inserted in deep pockets drilled in friction-type journal bearings

that it can hardly escape detection by the train crew, and that this is equally true whether cars are air conditioned or not. The odor is noticeable for about five minutes.

About the time the first of the road tests was made, several tender bearings on a switch engine operating in passenger helper service out of Albany were equipped with this alarm for the purpose of determining whether any of the materials, including liquids, used would show



Hot-box detection cartridges employed in friction journal bearings

deterioration as a result of age, vibration and repeated heating and cooling. These bearings, when removed on account of wear after about two years of service, were sent to West Albany laboratory for examination. The hot box alarms were found intact and, when set off by heating in an oil bath, were found to function at the stipulated temperature with no apparent loss of effectiveness.

Tests on Friction Bearings

Beginning in October, 1934, 500 alarm-equipped bearings were applied to J-1 class 4-6-4 type locomotive tenders. Later 500 additional applications were made to K-3 class 4-6-2 type tenders and a small number of passenger coaches. These applications were followed as a service test and care was taken at the outset to acquaint the train crews with the application. Small bottles of ethyl mercaptan were distributed so that the crews could become familiar with the nature of the odor released when the alarm functioned.

The cartridges for this initial application were somewhat crudely made and several false alarms were given by leaking cartridges. However, in the two-year period ending November 1, 1936, attention was called to 16 actual cases of hot-boxes by the functioning of the alarm device.

Typical of these cases is one which occurred on October 25, 1936, in which the left No. 3 tender journal box was discovered running hot by the odor discharged by the hot box alarm. The bearing was found with the lining melted out and the brass cracked. Some two and a half years earlier the left No. 3 tender journal box on this same train ran hot at about the same location. It was not equipped with a hot-box alarm and was not discovered until the journal had burned off and the entire train of nine cars had been derailed.

On October 15, 1937, 1,000 additional applications were authorized. These were applied more or less promiscuously to locomotive tenders and cars of various types over a considerable period of time. Because of the trouble experienced with these miscellaneous and scattered applications, all of which could be traced to defects, principally leaky cartridges, it was decided to defer further applications until a more satisfactory cartridge had been developed. A new design of cartridge was produced and all crown brasses of L-3b and L-3c locomotives were equipped with them in 1941 and 1942 by the builders. All L-3b locomotives have now completed at least one shopping period and there have been no reports of leaking cartridges on these locomotives.

In applications of this type of hot-box alarm to roller bearings only one cartridge was applied to each bearing. The smoke-producing cartridge was omitted because the roller-bearing manufacturers considered it unnecessary. The first applications to roller bearings on the New York Central were made in 1937 to four new combination mail-baggage and six new dining cars. The Pullman Company was requested to make similar application to new Pullman cars under construction for the New York Central. These experimental applications were gradually extended until hot-box alarms were in service on 312 passenger train cars of all kinds and on one or more classes of bearings of 174 locomotives, 75 of which have complete installations on all engine and tender bearings.

The experience in roller-bearing service is less favorable than with friction bearings. Most of the trouble on the New York Central was caused by defective cartridges. It is sometimes difficult in a roller bearing to locate the cartridge so that the fusible element will be sufficiently close to the source of heat generation to respond promptly to over-heating.

From January 1, 1942, to October 15, 1943, 61 leaking or discharged hot-box alarms were reported in roller-bearing boxes, the bearings of which were found not overheated and were continued in service. During the

(Continued on page 193)

Inserting a hot-box-detection cartridge in a trailer-truck roller-bearing housing

Reading T-1 Locomotives

Thirty 4-8-4's being built in company shops are designed for fast freight service and have a total engine weight of 441,300 lb. with 68,000 lb. tractive force—Combined heating surface is 6,134 sq. ft.

THE Reading now has under construction in its locomotive shops at Reading, Pa., 10 locomotives of the 4-8-4 type. These locomotives are identical with 20 others which were started in 1945. They are known on the railroad as Class T-1 and are for use in fast freight service. The engines develop a tractive force of 68,000 lb. and, with the booster, a total tractive force of 79,100 lb. The driving wheels are 70 in. in diameter.

Of the first 20 locomotives, the driving axles of 19 had driving boxes with Hennessy lubricators and one was equipped with Timken roller bearings. Of the 10 locomotives now under construction nine are being equipped with Timken roller bearings on the driving axles and one with crown bearing journal boxes fitted with Hennessy lubricators. The driving wheels are of the Boxpok type fitted with 70-in. tires and mounted on carbon steel axles. The General Steel Castings Corporation's four-wheel engine truck is of the rocker type construction, and is equipped with 36-in. wheels. The engine truck journals have Timken roller bearings. The trailer trucks are the Commonwealth four-wheel Delta type with 44-in. wheels and Timken roller bearings. The Franklin locomotive booster is applied to the rear trailer truck axle.

The foundation of these locomotives is a General Steel Castings Corporation's cast steel bed with the cylinder crossties and pump brackets cast integral. The cylinders are 27 in. by 32 in. fitted with cast iron cylinder bushings. The 13-in. valves are the piston type with 7½-in. travel, actuated by a Walschaerts valve gear which is controlled by a Ragonnet Type B, 10-in. power reverse gear. The crossheads are the multiple-bearing type and the main and side rods are forged of carbon steel with floating bushings at the main crank pins. The main wheels are cross balanced.

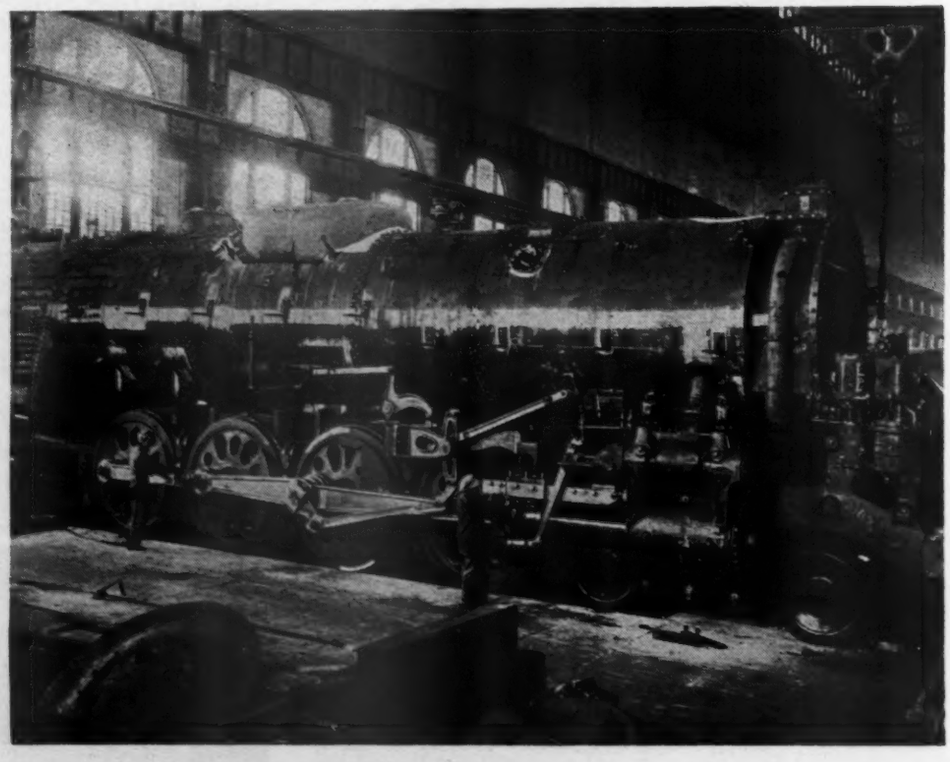
Mechanical lubricators are used to feed oil to a number of points on the running gear. An Edna Model A, 30-pint, 8-feet lubricator, on the right side, supplies oil to cylinders, valves, stoker, booster, flange oilers and guides. A King, Model 31, 24-point, 8-feed lubricator, on the left side, supplies the engine truck center plate and pedestals, driving box pedestals, trailer pedestals, and trailer truck radius bar seat. King Model 36 lubricators are used on the two air compressors and on the feedwater hot pump is a Nathan Type LBW lubricator.

The Boiler and Accessories

The boiler on these locomotives is the conical type having a large firebox with 465 sq. ft. of heating surface. The firebox has a grate area of 94.5 sq. ft. and is fitted

General Dimensions, Weights and Proportions of the Locomotive

Builder	Company Shops
Date built	1945, 1946
Road class	T-1
Road numbers	2100-2129
Steam pressure, lb. per sq. in.	240
Drivers, diameter, in.	70
Cylinders, number, diameter and stroke in.	2—27x32
Rated tractive force, engine, lb.	68,000
Rated tractive force, booster, lb.	79,100
Valve gear, type	Walschaerts
Valves, piston, diameter, in.	13
Maximum travel, in.	7½
Steam lap, in.	1 1/16
Exhaust clearance, in.	¼
Lead, in.	3/16
Cut-off in full gear, per cent	82
Dimensions:	
Height, rail to top of stack, ft.-in.	15—5
Height, rail to center of boiler, ft.-in.	10—3½
Width overall, ft.-in.	10—8¾
Length over engine and tender, ft.-in.	110—1½
Cylinder centers, in.	91
Wheel bases, ft.-in.:	
Driving	19—3
Rigid	19—3
Engine, total	45—10
Engine and tender, total	96—6½
Weights, lb.:	
Front truck	67,000
Drivers	278,200
Trailer truck	96,100
Engine, total	441,300
Tender (loaded)	367,700
Weight on drivers, per cent weight of engine	63.04
Weight on drivers—tractive force	4.09
Tender:	
Style or type	Rectangular
Water capacity, U. S. gal.	19,000
Fuel capacity, U. S. gal.	26
Trucks	Six-wheel



Putting up the rods and the motion work in the erecting shop

One of the 26-ton 19,000-gallon tenders under construction in the Reading Shop

General Dimensions and Proportions of the Boiler

Steam pressure, lb.	240
Diameter first ring, outside, in.	88
Diameter second ring, in.	Conical
Diameter third ring, outside, in.	96
Sheet thickness, in.:	
Smokebox	5/8
First ring	15/16
Second ring	15/16
Third ring	15/16
Back head	1/2
Side sheets	9/16
Roof sheet	9/16
Furnace door sheet	3/8
Furnace side sheets	3/8
Furnace crown sheet	3/8
Combustion chamber	3/8
Front tube sheet	5/8
Back tube sheet	5/8
Firebox length, in.	126 3/8
Firebox width, in.	108 1/4
Water space, front, in.	5
Water space, back, in.	4
Water space, sides, in.	4
Combustion chamber length, in.	45 1/2
Arch tubes, number, and diameter, in.	(2) 3 1/2
Syphons, number and location	3 in firebox 1 in combustion chamber
Tubes, number and diameter, in.	(291) 2
Flues, number and diameter, in.	(50) 5 3/8
Length over tube sheets, ft.-in.	20—0
Net gas area through tubes and flues, sq.ft.	9.40
Superheater, type	A
Fuel	Bituminous and anthracite
Grate area, sq.ft.	94.5
Stoker type	Standard HT
Feedwater heater, type	Worthington 5 1/2 SA
Heating surfaces, sq.ft.:	
Firebox and combustion chamber	327
Syphons	121
Arch tubes	17
Firebox, total	465
Tubes and flues	4,455
Evaporative, total	4,920
Superheater	1,214
Combined evap. and superheat.	6,134
Boiler proportions:	
Firebox heat. surf., per cent comb. heat. surf.	7.58
Tube-flue heat. surf., per cent comb. heat. surf.	72.6
Superheat. surf., per cent comb. heat. surf.	19.8
Firebox heat. surf. ÷ grate area	4.92
Tube-flue heat. surf. ÷ grate area	47.1
Evap. heat. surf. ÷ grate area	52.0
Superheat. surf. ÷ grate area	12.8
Comb. heat. surf. ÷ grate area	64.9
Gas area ÷ grate area	0.0993
Tractive force ÷ grate area	719.6
Weight of engine ÷ evap. heat. surf.	89.7
Weight of engine ÷ comb. heat. surf.	71.9
Tractive force ÷ evap. heat. surf.	13.8
Tractive force ÷ comb. heat. surf.	11.1
Tractive force × diameter drivers ÷ comb. heat. surf.	776.0

with a Security brick arch supported on three Syphons and two arch tubes. An additional Syphon is located in the combustion chamber, which extends into the boiler barrel 45½-in. A complete installation of Flannery flexible staybolts is included in the firebox, located in the sides, throat, back head and combustion chamber. The crown stays are of the riveted type.

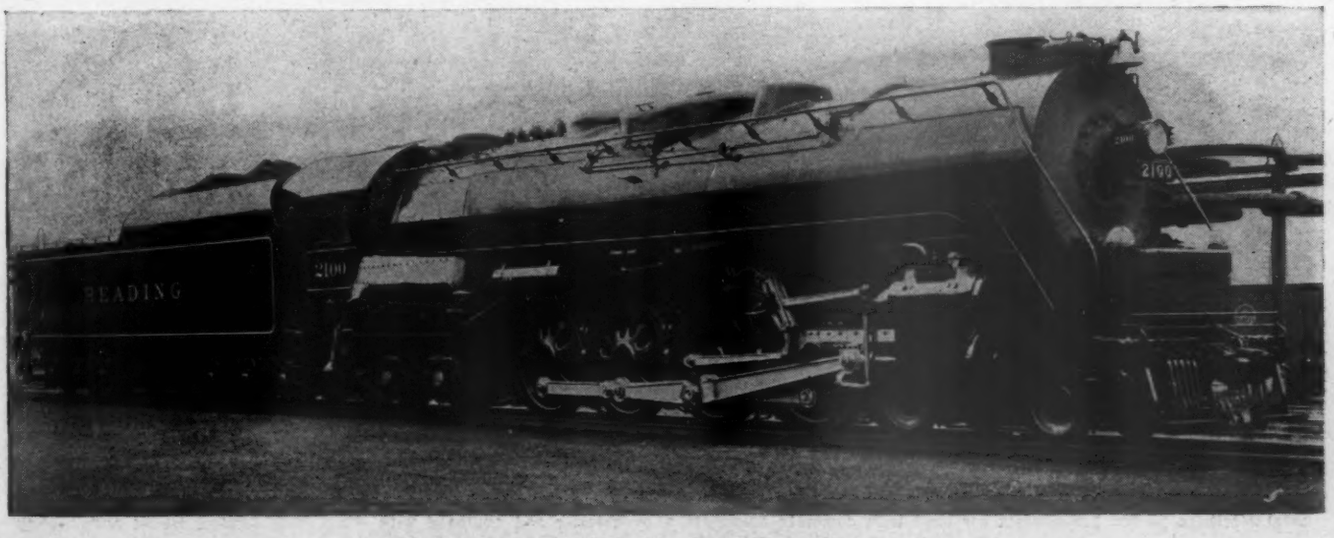
The boiler barrel is built in three rings each having 15/16-in. sheets. The second ring is conical and the dome is located in the third ring. The firebox roof and side sheet, in one piece, is 9/16-in. thick and the firebox sheets, crown, side and combustion chamber, are 3/8-in. The front and back tube sheets are 5/8-in.

The firebox length is 126 3/8-in. and the width 108¼-in. These boilers are designed to burn a mixture of 10 per cent anthracite and 90 per cent bituminous coal.

The boilers are equipped with the Elesco Type A super-

Partial List of Materials and Equipment on the Reading T-1 4-8-4 Type Locomotives

Engine-bed; engine and trailer trucks	General Steel Castings Corp., Eddystone, Pa.
Driving wheels; driving wheel tires; springs	Standard Steel Works, Div. of Baldwin Locomotive Works, Inc., Philadelphia, Pa.
Driving box lubricators	Hennessy Lubricator Company, New York.
Lateral motion device	American Locomotive Company, New York.
Radial buffer; firedoor; locomotive booster	Franklin Railway Supply Co., Inc., New York.
Roller bearings; engine truck and trailer truck; driving wheels	The Timken Roller Bearing Co., Canton, Ohio.
Air brakes; air signals; driver brake	Westinghouse Air Brake Co., Wilmerding, Pa.
Brake shoes	American Brake Division of Westinghouse Air Brake Company, Swissvale, Pa.
Sanders; piston rod packing; valve-stem packing; mechanical lubricators	U. S. Metallic Packing Co., Philadelphia, Pa.
Cylinder and valve bushings	Hunt-Spiller Manufacturing Corporation, Boston, Mass.
Cylinder protection valves; cylinder cocks; cylinder cock operating valves	The Prime Manufacturing Co., Milwaukee, Wis.
Mechanical lubricators; boiler check	Edna Brass Mfg. Co., Cincinnati, Ohio.
Lubrication grease fittings	Alemite Division, Stewart-Warner Corp., Chicago.
Lubricator booster oil control valves; lubricators for feedwater heater	Nathan Manufacturing Co., New York.
Arch tubes	National Tube Co., Pittsburgh, Pa.
Flues and tubes	Detroit Seamless Tube Co., Detroit, Mich.; National Tube Co., Pittsburgh, Pa.
Flexible staybolts	Flannery Bolt Co., Bridgeville, Pa.
Brick arch	American Arch Co., Inc., New York.
Thermic Syphons, Cyclone front end	Locomotive Firebox Co., Chicago.
Superheater	The Superheater Company, New York.
Throttle valves; throttle rigging	American Throttle Co., New York.
Feedwater heater	Worthington Pump and Machinery Corp., Harrison, N. J.
Feedwater heater pump control valve	The Lunkheimer Company, Cincinnati, Ohio.
Injector	Ohio Injector Co., Wadsworth, Ohio.
Steam gauges	Locomotive Equipment Division of Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Washout plugs; blow-off cock	T-Z Railway Equipment Co., Chicago.
Stoker	Standard Stoker Co., Inc., New York.
Grates	Hulson Grate Co., Keokuk, Iowa.



The first of the Reading's Class T-1 fast freight locomotives

Bearings; brass castings	Magnus Metal Div., National Lead Co., New York.
Smokebox hinges	The Okadee Company, Chicago.
Tender:	
Frame; trucks	General Steel Castings Corp., Eddystone, Pa.
Roller bearings (20) (10)	SKF Industries, Philadelphia, Pa. Timken Roller Bearing Co., Canton, Ohio.
Clasp brakes	American Steel Foundries, Chicago.
Axles; springs	Standard Steel Works Div. of Baldwin Locomotive Works, Inc., Philadelphia, Pa.
Draft gear; hand brake	W. H. Miner, Inc., Chicago.
Wheels	Carnegie-Illinois Steel Corp., Pittsburgh, Pa.
Side bearings	A. Stucki Co., Pittsburgh, Pa.
Brake application valve	Westinghouse Air Brake Co., Wilmerding, Pa.
Tank level indicators	Locomotive Equipment Division of Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Spring shackle seat pads; coil spring seat pads	Fabreeka Products Co., Boston, Mass.
Paint	E. I. duPont de Nemours & Co., Inc., Wilmington, Del.

heater having a superheating surface of 1,214 sq. ft. Water is fed by a Worthington Type 5½ SA open type feedwater heater having an hourly capacity of 10,000 gallons. Additional feeding capacity is furnished by an Ohio, Type T-60 injector having a capacity of 8,000 gallons per hour.

The locomotive and tender brake equipment is Westinghouse No. 8ET and the air compressors, two in number, are the Westinghouse 8½-in. cross-compound type located at the front end of the locomotive on brackets cast as a part of the engine bed.

The tender is the rectangular type with General Steel Castings Corporation's cast steel water bottom frame. The tender tank has a capacity of 19,000 gallons of water and 26 tons of coal. The tender is carried on two General Steel Castings six-wheel trucks and has a total wheel base of 37 ft. 8½ in. The tender truck axle journals are all of the roller bearing type, ten being of the Timken design and the remaining 20 being of the SKF type.

Long-Travel Springs On Great Northern Box Cars

In 1944 the Great Northern built 1,000 50-ton box cars of plywood construction* at the St. Cloud, Minn., shops, a part of which were equipped with A.S.F. Ride-Control trucks.† Late in 1944 this railroad also turned out one 50-ton steel-frame car with an all-aluminum exterior. This car and 24 of the plywood cars are fitted for box-express service. For this service the trucks have the longest travel of the three spring sizes which can be used in it—$3^{13}/_{16}$ in. The specifications for these springs are as follows:

	Outer	Inner
Springs per group	5	5
Bar size (round edge flats), in.	$1 \times \frac{7}{8}$	$\frac{7}{8} \times {}^{7}/_{16}$
Outer diameter, in.	5½	3⅜
Free height, in.	10⅜	10⅜
Solid height, in.	$6^{9}/_{16}$	$6^{9}/_{16}$
Travel, in.	$3^{13}/_{16}$	$3^{13}/_{16}$
Group capacity, lb.	57,300	
Group capacity, lb.	57,300	
Group load rate (per 1/16-in. deflection), lb.	950	

* Great Northern Builds 1,000 50-ton Box cars, page 345, August, 1944, *Railway Mechanical Engineer*.

† Two A. S. F. Truck Designs, page 89, February, 1944, *Railway Mechanical Engineer*.

German Development of Locomotives and Cars

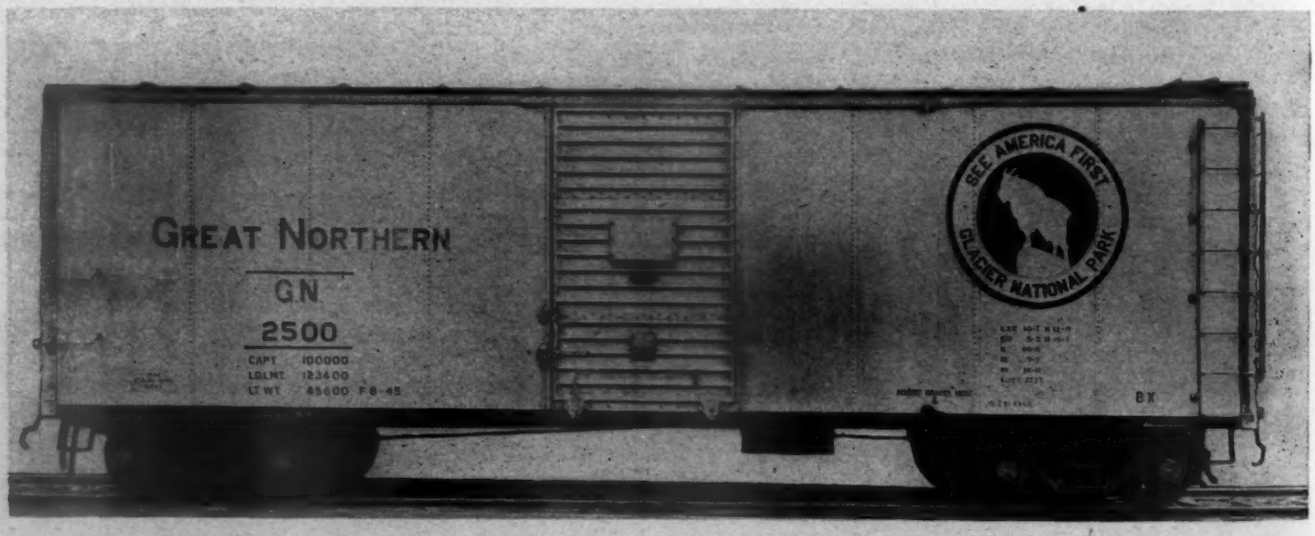
(Continued from page 185)

As a war necessity, with the reduced availability of copper, the bronze used in this bearing was reduced to three 1⅜-in. strips dovetailed into the iron shell, one in the crown and one in the approximate center of each quarter section from the crown; and seven $1^{3}/_{16}$-in. round bronze plugs driven into and expanded in the lateral face. The plugs protect the journal surface in case of a hot journal melting out the white metal.

The crown and adjacent inner surfaces of the shell are dovetailed along the length dimensions and lateral face circularly to hold the lining. The lining is composed of 15.5 per cent antimony, 10 per cent tin, 1.0 per cent copper, and 73.5 per cent lead. After pouring, the lining is finished to a thickness of approximately $^{5}/_{16}$ in. in the crown and $^{7}/_{32}$ in. on the lateral face. Satisfactory service is reported and it is intended to continue this design.

Some of the older and smaller car journals are equipped with unlined bronze bearings but the more recently constructed and larger units carry white-metal lined ones. These are all oil lubricated by means of a spring supported pad with numerous threads suspended in the oil pan or well for capillary feeding of the oil.

Some of the 80-ton cars built for transport of heavy



Great Northern 50-ton box-express car built with complete aluminum alloy exterior and equipped with A.S.F. Ride-Control trucks and Timken roller bearings

war machines are equipped with roller bearings. These are dual units with tapered rollers and are of German manufacture.

Mention was made outside of Germany of the use of bearings of sintered iron impregnated with graphite, and sintered iron and lead. In Germany no use of these on motive power or rolling stock could be located or any information obtained. One bearing of sintered iron and graphite was seen on a small centrifugal water pump. This feature is another of those under investigation by especially qualified groups.

Lubricants

Dr. Ing. Pless, chief mechanical engineer, DRB, stated that a synthetic oil identified as Y oil had been developed which produced an improved axle journal performance on both locomotives and cars. He was unable to supply the specifications as his files had either been removed to an unknown location or destroyed. However, the information as to the existence of this oil was made available to the scientific group investigating liquid fuels and lubricants and will no doubt be reported at a later date.

"Smoke-and-Odor" Hot-Box Alarm

(Continued from page 188)

same period six roller-bearing failures occurred in which it was reported that the hot-box alarm did not discharge. In the case of 14 other failures the alarm functioned as intended; serious damage was averted.

It was found that cleaning of roller-bearing boxes in a solution having a temperature of around 200 deg. F. was causing the fusible plug, which melts at 220 deg. F., to leak, so instructions were issued at the end of October, 1942, to clean these boxes in a solution having a temperature not exceeding 160 deg. F. It was also learned that some inspection points made a practice of rubbing the end of the hot-box alarm with a packing iron and then smelling the iron to see if the alarm was leaking. This practice has been discontinued because of damage to the fusible plug. Such action is not required to detect a leaking alarm.

In order to guard against defects of manufacture, it is now required that all cartridges, after filling, be tested in water at a temperature of 200 deg. F. for five to ten minutes for leakage. Leaky cartridges can be detected without difficulty by this test. When cartridges are removed from the bearing during shop repairs, or for any other reason, a similar test is made before they are reapplied.

Relocation of hot-box alarms in roller-bearing boxes to place them nearer the rollers and races in order to reduce to a minimum the possibility of failure to discharge when the bearing fails is under consideration by the roller-bearing manufacturers. It has been found impracticable, however, to relocate the alarms in some bearings.

The experience of the New York Central has led to the conclusion that the smoke-and-odor type of alarm provides a practicable means of assisting train crews and others on duty along the right-of-way in the detection of hot boxes of either the friction- or the roller-bearing type before serious trouble develops. The first cost is believed to be much less than that of any other type of hot-box warning device now available, and only routine maintenance attention is required during the life of the bearing; furthermore, the average costs are expected to be reduced in the course of time by the reclamation of cartridges and their reapplication to other bearings.

Believing that fully satisfactory results cannot be attained unless the applications are sufficiently extensive so that train crews, crossing watchmen and maintenance men can be properly instructed and become familiar with the device, the New York Central has embarked upon a program of application which includes all new roller-bearing passenger-train cars, all head-end passenger-train cars with friction bearings, all air-conditioned passenger cars with friction bearings, and all high-speed passenger locomotive bearings. This involves the installation of cartridges in more than 35,000 bearings.

The alarm is protected by patents and patents pending, and is known as the Twinplex Hot-Box Alarm. Friction bearings equipped with this alarm are furnished by the Magnus Metal Corporation under an agreement which stipulates that they will also license other bearing manufacturers to apply the alarm, provided cartridges are purchased from Magnus. Alarm-equipped roller bearings are furnished by the Timken Roller Bearing Company and this company also supplies the cartridges for application by other roller-bearing manufacturers.

Both the Timken and the Magnus companies cooperated with the New York Central in this development.

* * *

D. & R. G. W. 250-ton derrick recently purchased from Bucyrus-Erie and formally christened at Grand Junction, Colo.—The photo shows general car foreman A. G. Martin (center) with members of the derrick crew and local stenographic force

EDITORIALS

Where Will the Savings Be Made?

It has been suggested many times in these columns that the railroads could well afford to set up shop engineering departments, even on relatively small roads, to study the possibilities of effecting economies in the maintenance of locomotives and cars. Such a department would be charged with the responsibility of keeping currently posted on developments, not only in the railroad field, but in industries using equipment such as is used or could be used by the railroads in carrying on their work.

Never in the history of industry have there been so many new things which have potentialities as far as savings in operating costs are concerned. The advancement in the arts of welding and metal working alone are so great as a result of the production experience of the war years that a very substantial part of the processes or methods that were used in industry prior to the war are already obsolete.

There may be railroads and railroad men who feel satisfied that their road or their industry has kept pace with the developments in other fields but almost anyone whose everyday work brings him in contact with the railroads and also with other industries knows that, in many respects, the roads are far behind in adapting the ideas, materials and processes that are waiting for them at this moment. And, strangely enough, it does not seem that there is any group of individuals on the average railroad whose sole job is to find out about these things and see that their road takes advantage of the economies that should rightly be theirs. Most everyone on a railroad is so busy just keeping the railroad running that they have no time to think about the broad problem of spending money wisely to save money.

Take shops, for example. Until the past year no locomotive shops have been built in this country since before the depression. Almost every road in the country is repairing locomotives and cars in repair plants that were designed and built back in the days when they had twice as many locomotives of considerably smaller type than they have today and these shops are still equipped with twice as many machine and tool units as are needed for the simple reason that in most of the major shop departments the tools are so old that they eat up twice as many man-hours to produce the same job as could be produced on a far smaller number of modern machines in half the time. In shop after shop the railroads are being denied the economies of modern cutting tools for no better reason than that a machine is in too poor condition or of insufficient power to handle a job with the new tools.

When and if the wage increases which labor is now demanding of the railroads become an established fact the roads are going to find themselves face to face with a set of facts that point conclusively to the necessity for effecting drastic reductions in operating expenses. We wonder if mechanical and executive officers are fully alive to just what this means. In round figures, for example, a road with about 500 locomotives, 2,000 freight cars and 500 passenger cars has a maintenance of equipment department wage bill of around seven or eight million dollars annually. At a dollar an hour each 10 per cent increase in that wage bill amounts to the annual earnings, straight time, of about 300 men. If, in order to remain solvent, it is going to be necessary to perform the work of 300 to 600 men without having the men on the payroll somebody is going to have to get busy in a hurry and provide the improved facilities that will be needed to solve this problem.

Right now railroad men are suffering from a self-induced wave of economy which usually takes the form of reduction of forces and suspension of buying capital goods used in maintenance of equipment. There's a limit to this type of economy and it is worth while to suggest that the roads had better start on a definite program of studying and making improvements that will effect permanent reductions in costs.

Education Urgently Needed

Printed in this issue is a report of a survey of the attitude of railway employees toward their jobs and toward the railway industry and its problems. This survey was conducted by the Opinion Research Corporation for the Railway Age and two of its associated technical monthly publications, the *Railway Mechanical Engineer*, and Railway Engineering and Maintenance. It covers 1,309 interviews with persons carefully selected to represent a cross-section of railway workers correctly proportional as to jobs, regions, and ages. The probability is extremely high that the opinions expressed will not err from those actually held by the 1,400,000 railroad employees by as much as four per cent, so far as the effect of the size of the sample is concerned.

The nature of the replies to many of the questions asked is not greatly different qualitatively from what would be expected. They do substitute facts for gen-

eral impressions, however. But with respect to information about the industry and attitudes toward certain questions of public policy affecting its welfare, there is a disturbing lack of accurate information and of objectivity in attitude which should command the thoughtful attention of every railway officer, irrespective of the department within which his responsibility lies. Furthermore, their state of ignorance is accepted with complacency by a large percentage of the employees. For instance, less than half of the employees believe that they get a larger share of railroad revenues than the shareholders. On the questions of full crews and train limitation, 79 per cent and 64 per cent of the employees, respectively, believe them to be a good thing, and 12 per cent of those who favor them do so in spite of their belief that they will discourage traffic.

The facts concerning the poorly informed opinions of substantial percentages of railway employees in matters concerning which the railroads are vulnerable to political action are a challenge to the industry, and to every corporation in it, to formulate and undertake sustained campaigns of education in the planning of which the best specialized knowledge skill available should be employed.

An encouraging aspect of the survey is the evident friendliness of employees, generally, toward the industry and toward the officers responsible for its management and operation. With this as a foundation on which to build, the problem of education can be approached with reasonable optimism.

Relighting The Railroads

Among all of the railroad facilities affected by war restrictions and deferred maintenance, lighting is near the top of the list. The reasons for this situation are numerous. First, materials have been at a premium or were unavailable. Second, lighting equipment in shops, enginehouses and yards is constantly subjected, and is vulnerable, to the corrosion caused by smoke, dirt and locomotive gases. This affects conduit, wiring and switches as well as lighting fixtures. The blackout also had its influence. While its effect was largely psychological, it undoubtedly caused the deferment of many badly needed installations. Where additions and improvements were made, it was frequently necessary to install material which required concessions by administrators of wiring codes. As materials become available, it is probable that code requirements will again be raised, necessitating the replacement of temporary or substandard wiring.

Passenger-car lighting, as well as that on fixed property has suffered from the same circumstances. New cars on order and under construction will have the best lighting which industry can produce. This will throw many of the old and deteriorated systems into sharp contrast, and will require replacements, particularly if the older cars are to be used in the same trains with new cars. Passengers are still reconciled to war and reconstruction conditions, but with increasing competition, they are certain to become more critical.

The situation is not without compensations. In the period since lighting facilities were installed in quantity, there have been radical developments in light sources and lighting equipment. Notable among these is the fluorescent lamp. It was being used in quantity before the war restrictions were imposed, but the lamps and auxiliaries were not well developed and fixtures included a hodge-podge of tinware thrown together to meet a demand which grew too fast to permit adequate design and engineering.

Now there are good lamps, good auxiliaries and well designed fixtures. They are still available in limited quantity, but they afford some real opportunities. They have good distribution characteristics, they require a minimum of cleaning, and as replacements they may produce from two to five times the illumination of the old systems, with no increase in power consumption. They will satisfactorily improve car, office and low-bay shop lighting. The slimline and the circleline lamps afford numerous possibilities for special applications.

For high-bay shop lighting, some new equipment is to be had in the form of high-intensity mercury-vapor lamps. The 400-watt lamps have been available or have been in limited service for some time and to these are being added the 1,000-watt high-intensity lamp, and the 3,000-watt tubular lamp. Use of the 400-watt lamp has been retarded somewhat by its relatively high first cost and high replacement cost so that with very low power rates it is difficult to justify its application. Increased production should change these factors and the larger size lamps should also help by reducing the number of fixtures required.

The value of good lighting is difficult to measure. Almost invariably, it results in improved working conditions and causes a "policing" of the shop. Scrap somehow gets picked up and because dirt becomes conspicuous, it is removed. Accident rates are so low that a measurement of their reduction in terms of lighting is usually impossible. Shop management is quite naturally unwilling to concede increased work output to better lighting, but in the annals of railroad history, no one except those who wish to hide out in dark corners has ever objected to really good lighting.

Wheel Defects

In view of the vital part played by car wheels in rail transportation, too much emphasis can hardly be placed on the provision of an adequate force of competent inspectors to assure the removal of all wheels from

service as soon as required by wear conditions, or any defects specified in the A.A.R. interchange rules. Not only must these wheels be removed promptly, but an analysis of the causes for unusually rapid wear and wheel defects of all kinds has been found on many roads to be a basic requirement for improving wheel conditions from the point of view of increased service life, economy and reliability.

A study of the causes for freight-car wheel removal, reported at the January 15 meeting of the Car Department Association of St. Louis, showed the usual predominance of roughly 22 per cent of wheels removed on account of cut journals; 16 per cent, out of round, Rule 73; 14 per cent, seamy wheels, Rule 72; 13 per cent, broken rims, Rule 78 R; 9 per cent, brake burn comby, Rule 75 C; 6 per cent, brake burn cracks. Rule 75; 6 per cent, chipped flanges, Rule 78; 4 per cent, slid flat, Rule 68; 2 per cent, tread worn hollow, Rule 76; and about one per cent each for the following causes: shell out, Rule 71; thin flange, Rule 74 T; vertical flange, 74 V; combination tread defects, Rule 75 A; built-up tread, Rule 107.

Analyzing these causes for freight-car wheel removal, it is obvious that the most prolific single cause, namely cut journals, which necessitates taking out of service 22 of each 100 wheels removed, is not primarily due to any wheel defect. The second most frequent cause, out of round, accounting for 16 per cent of the wheels removed, is found in both chilled cast and steel wheels. The next five causes, namely, seamy wheels, broken rims, brake burn comby, brake burn cracks and chipped flanges, accounting for a total of 48 per cent of the removals, are almost exclusively chilled-wheel defects, which is not necessarily an indictment of this type of wheel, since it is used on approximately 80 per cent of present freight equipment and hence appears on repair tracks in proportionately much larger numbers than all other types combined.

The next six defects, including slid flat, tread worn hollow, shell out, thin flange, vertical flange and combination tread defects, account for a total of 10 per cent of the wheels removed and are found in both chilled cast and steel wheels. Built-up tread conditions are found only in steel wheels. The study referred to showed no occurrence of defects, such as broken and cracked plates and brackets in chilled cast wheels, or loose bolts in steel-tired wheels. It stated that there are 19 defects which must be looked for in chilled cast wheels and a total of 23 defects in multiple-wear, two-wear, one-wear wrought steel, cast-steel and steel-tired wheels.

The A.A.R. interchange rules covering freight-car wheels, like all other car details, have been devised to utilize gages fully and eliminate insofar as practicable "judgment" defects, regarding which individual car inspectors may disagree. In the last analysis, however, it is the experience and good judgment of car inspectors, backed up by their respective foremen and car-department officers, which must determine whether a loaded car is safe to move to its destination with some undesirable wheel condition, or whether the car must be delayed long enough to change the wheels.

Car inspctors should be encouraged to examine carefully not only old but new wheels, for it happens occasionally that even new wheels are turned out of foundries or steel mills and wheel shops with defects which have been overlooked and constitute a potential hazard. Railroads have no more important responsibility than training and developing car inspection forces competent to inspect and remove from service wheels, as well as other car parts, which are defective and hence likely to interfere with safe, fast, modern rail transportation service.

NEW BOOKS

TWO-WAY RADIO—*By Samuel Freedman. Published 1946, by Ziff-Davis Publishing Company, New York and Chicago. 506 pages, 6 in. by 9 in. Illustrated. Bound in cloth. Price $5.00.*

The book describes the mechanics and applications of two-way radio for all forms of fixed, mobile and portable communications. It is presented in non-mathematical form and in simple language, which is fully understandable to persons using or who are intending to use such facilities.

In writing it, the author has drawn on his experience which dates from the time of spark transmitters and crystal receivers. He began his career with the Postal Telegraph Company, and has worked as a ship operator with the Marconi Wireless Telegraph Company. He has designed and made numerous installations of two-way radio systems for public agencies, including police and forestry services, and has served twelve years in the United States Navy as a radio specialist. He is now a commander attached to the U. S. Navy Electronics Laboratory, at San Diego, Calif.

Equipment described in the book ranges from 5 kilocycles to beyond 10,000 megacycles. Also included is a thorough description of induction radio and carrier current communication techniques. A ninety-page chapter on two-way radio for railroads deals with problems peculiar to railroad radio, with the uses of radio for railroad operation, with radio as a safety device, with train power supply, and describes various types of radio and inductive communication systems designed for railroad service. The possibilities of microwave communication for railroad application are also discussed at some length.

Other chapters in the book deal with basic requirements and characteristics of radio equipment and with police, highway, marine and aircraft, and personalized applications. There are also chapters which deal with maintenance and repair, with licenses and with regulations.

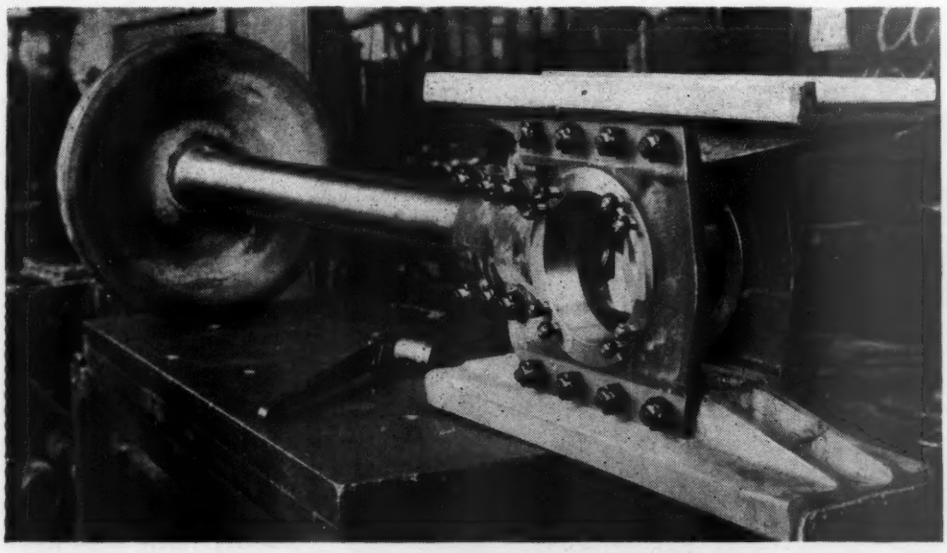
Maintaining Timken Piston Rods and Crossheads

In order to facilitate counterbalancing steam locomotives for high-speed operation, the Chicago, Burlington & Quincy has equipped 18 of its M-4-A locomotives of the 2-10-4 type with Timken lightweight pistons, hollow piston rods, two-part crossheads and tin-faced aluminum-alloy crosshead shoes. Thirty-six Class O-5-A locomotives of the 4-8-4 type are similarly equipped, the only difference being the use of somewhat shorter piston rods.

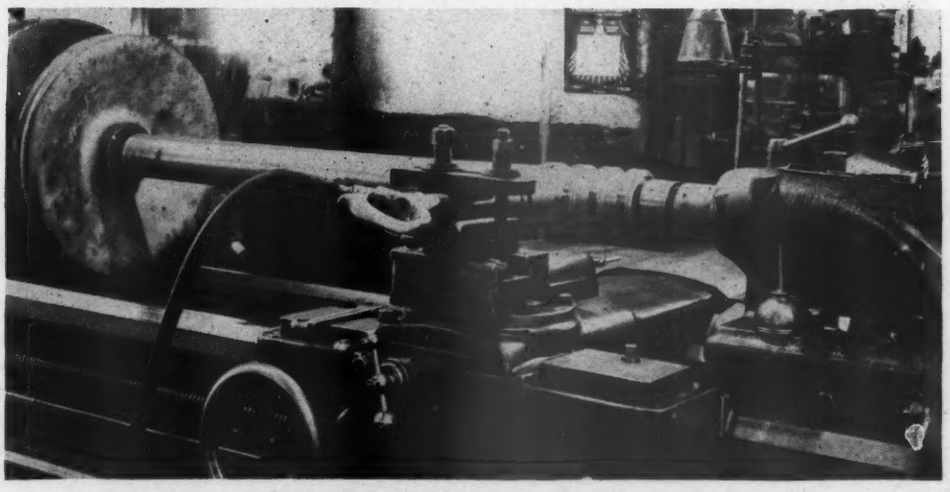
As these locomotives are shopped for heavy repairs it is important that the lightweight reciprocating parts, made of Timken High-dynamic alloy steel and fitted to close tolerances, be carefully inspected and, where worn below shop-limits, either scrapped or built up and re-machined to standard dimensions, in order to assure uninterrupted service until the next shopping. Uniform maintenance procedure is essential in connection with these vital parts and all Timken piston-rod and cross-head assemblies on Burlington locomotives, needing repairs, are shipped to the Aurora, Ill., shops where special tools, gages and trained men are available to overhaul them.

On receipt at Aurora the piston, rod and crosshead parts are disassembled as necessary and cleaned with mineral spirits, equivalent to carbon-tetrachloride. They are then painted with alcohol and whiting and tested by the Magnaflux method for possible checks and cracks. The piston grooves are gaged and, if too wide, the land between the two rings is built up by electric welding and the standard groove width restored by machining in a Bullard vertical turret lathe. While the piston grooves are being built up, care is exercised to keep the head at about 800 deg. F., the temperature thus being always below the normalizing point. The piston rod is ground in accordance with standard practice if it can be finished above the shop limit for size.

The piston-rod crosshead fit is checked with a special gage and, if there is any evidence of wear on the keys, they are widened slightly by placing the rod in an engine lathe equipped with an air hammer in the tool post, as shown in one of the illustrations, and each key is peaned around its circumference, using a rounded tool in the air hammer. Widening of the keys in this way gives a little



Assembled Timken piston, rod, crosshead and aluminum shoes after reconditioning at Aurora shops



Widening worn Timken piston rod keys by peening in a lathe

Bluing gauges, plug gauges for rod fit in piston, ring gauges, rod diameter gauges and piston profile gauges used in reconditioning Timken piston rod and crosshead parts

extra stock which permits them to be re-machined in the same engine lathe to standard size as regards lateral, this size being again checked with the special gage block and bluing to indicate points of bearing. By using this method, the piston-rod end may be reworked two or three times instead of requiring that the rod be scrapped the first time lateral play develops on the keys.

The crosshead halves are also checked using special bluing gages developed to test all vital dimensions. If the keyways are worn, the bearing surfaces are built up and refinished to standard size on a milling machine. When the wrist-pin holes are worn they are bored and bushed, the bushings being applied with a light press fit and rolled at the corners to hold them in place. The crosshead halves are then assembled on a stub-end piston rod so they can be set up in the boring mill for facing and grinding. New crossheads are also similarly machined from rough forgings, purchased from the manufacturer.

Timken pistons built up on the center land for remachining standard ring grooves

Reworked Timken piston rod and crosshead halves ready for re-assembly

The extruded aluminum crosshead shoes, lined with block tin for guide-bearing surfaces, are re-tinned in a bath carefully restricted to a temperature of 600 to 700 deg. F. The old tin is melted off, the aluminum surfaces then being thoroughly scratched to break down the oxide coating and allow the tin to adhere. The shoes are again immersed in the tin bath and brought up to temperature. The next operation is to clamp the shoes, two at a time, in a vertical position to a preheated mold which is packed with stiff fire clay to seal all openings. The tin is poured

slowly and allowed to "head" in order to avoid porosity.

Aurora shops is equipped to weld aluminum if necessary and so worn bolt holes in the crosshead shoes are built up with aluminum and drilled and reamed to standard size, which is 1.000 in. min. diameter and 1.001 in maximum. The corresponding holes in the crosshead halves are checked and, if worn, they are drilled for the application of $\frac{3}{16}$-in. steel bushings which are pressed in and slightly peaned over at the corners to give added resistance to movement when the crosshead shoes are assembled in place and the holding bolts applied.

The final reaming operation on crosshead bolt holes is done with the shoes in place and firmly clamped against the crosshead bearing surfaces so the vertical component of the main rod thrust will be resisted by these surfaces rather than the bolts alone which could not take high pressures long without excessive wear or breakage. Some idea of the accuracy required in reconditioning these crossheads is afforded by the fact that only .001 in. tolerance is allowed in fitting the bolts which hold the crosshead shoes in place.

Specific detailed instructions regarding the assembly of the Timken crosshead and piston rod, also the main rod, wrist pin, etc., when assembled on the locomotive, are followed in order to assure satisfactory service.

Locomotive Boiler Questions and Answers

By George M. Davies

(This department is for the help of those who desire assistance on locomotive boiler problems. Inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless special permission is given to do so. Our readers in the boiler shop are invited to submit their problems for solution.)

Relation of Temperature ond Color

Q.—Can the temperature of a furnace be determined by the color of the fire or flames?—R. E. R.

A.—A. S. M. E. Transactions, Vol. XXI, give the following means of determining approximately the temperature of a furnace from the character of the emitted light. The color at a given temperature is approximately the same for all kinds of combustibles under similar conditions.

Character of Emitted Light	Temperature, deg. F.
Dark red, blood red, low red	1,050
Dark cherry red	1,175
Cherry, full red	1,375
Light cherry, bright cherry, light red	1,550
Orange	1,650
Light Orange	1,725
Yellow	1,825
Light yellow	1,975
White	2,200

Caulking Aluminum Seams

Q.—In constructing a riveted aluminum tank, can the seams be caulked for tightness in the same manner as with a steel tank?—D.E.V.

A.—The riveted joints of an aluminum tank which must be pressure tight may be caulked either by deforming the edges of the plates with a caulking tool or by using caulking strips of a softer alloy to seal the joint. Joints which are to be caulked in this manner should have edge distances about one and one-half times the rivet diameter or about four times the thickness of the plate. The spacing of the rivets should not exceed four times the rivet diameter nor about ten times the thickness of the plate. In some types of riveted seams where it is not convenient to caulk with a caulking tool, the joint often can be made pressure tight by packing it with a material to act as a seal. It is important that such a material be non-absorbent, firm enough so it will not "bleed" through the joint, and over a period of time tough enough not to crack or spall. Such packing material should be non-corrosive to aluminum and should be applied in layers thin enough not to affect appreciably the strength of the joint.

Cracking of Front Tube Sheet

Q.—Does the thickness of a front tube sheet have any effect on its ability to withstand cracking in the knuckle or flanged corner of the sheet?—R. F. K.

A.—A canvass of 54 railroads conducted by the Master Boiler Makers' Association showed that the greatest source of trouble with front tube sheets was cracked knuckles and that this condition existed on all thicknesses of sheets in use.

Laying Out Butt-Strap Rivet Holes

Q.—In laying out the butt straps or welts of a longitudinal seam, how are the spaces between the rows of rivets laid out so that the rivet holes in the inside and outside butt straps line up with the holes in the shell course?—R. S. A.

A.—In laying out new butt straps for an old shell course, templates are made of the rivet holes in the shell course and transferred to the new butt straps. A template of the holes on the outside of the shell is transferred to the inside of the outside butt strap and a template of the holes on the inside of the shell course is transferred to the outside of the inside butt strap after the butt straps have been rolled. In laying out new work, the spaces between the rows of rivets for the shell course and the butt straps can be determined by the proportional method before the sheets are rolled. The spaces between the rivets rows for the outside butt straps will be increased over the rivet spaces laid out in the shell course and decreased for the inside butt straps. These dimensions may be calculated by the use of the proportional method as follows:

$$R : A = r : X$$

where

R = Neutral radius of shell, in.
A = Space between longitudinal rivet rows, shell, in.
r = Neutral radius of butt strap, in.
X = Space between longitudinal rivet rows, butt strap, in.

Feedwater Impingement

Q.—What is meant by the term, impingement, used in connection with the feedwater of a locomotive boiler?—R.A.D .

A.—Impingement or the shock of impingement is the action of the feedwater in entering the boiler against the water already in the boiler, chiefly due to their difference in temperature. Impingement can be reduced by increasing the temperature of the feedwater, by the use of feedwater heaters, live-steam injectors, exhaust-steam injectors and also by passing the water through the steam space of the boiler before being mixed with the water in the boiler. The latter is done by the use of a top

boiler check and a spreader, which divides the entering water stream into two streams pointed at each side, and some form of plate or discharge box over the dry pipe. To obtain a more prompt and more complete heating of the water as it enters the steam space a spray nozzle is used sometimes in place of the spreader. The water issues from the spray nozzle in the form of an unbrella-shaped film that is immediately broken up into a spray as it strikes and condenses the steam and complete heating is assured. The combination of the feedwater heater, the top boiler check and the spray nozzle is an ideal feedwater heating arrangement. The feedwater heater has all the advantages of heating by exhaust steam at all operating conditions of the locomotive. The top boiler check and spray nozzle have the advantage of heating the feedwater by live steam and making the water temperature the same throughout all parts of the boiler and almost completely eliminates the shock of impingement.

Factor of Safety

Q.—How was the factor of safety of four established for locomotive boilers? What I want to know is how to arrive at that four?—J. R. F.

A.—The term factor of safety is defined as the ratio of the ultimate strength of material or structure to the allowable stress. In boiler work the term, factor of safety, can be taken as the ratio of the bursting pressure to the working pressure, thus:

$$\text{Factor of safety} = \frac{\text{Bursting pressure}}{\text{Working pressure}}$$

All locomotive boilers operating in the United States must have a factor of safety of four to comply with the locomotive inspection law. The factor of safety of four is an arbitrary margin of safety set by law to protect against (1) deterioration due to corrosion; (2) errors in workmanship; (3) the interdependence of parts; (4) the probability of overload; (5) stresses due to method of suspension, and (6) lack of homogeneity in the material. The factor of safety computed by the following formula must not be less than four in order to comply with the locomotive inspection law.

$$\text{Factor of safety} = \frac{T \times t \times E}{R \times P}$$

where

T = Ultimate tensile strength stamped on shell plates, lb. per sq. in.
t = Minimum thickness of shell plates in weakest course, in.
E = Efficiency of longitudinal joint or ligaments between tube holes (whichever is the least).
R = Inside radius of the weakest course of the shell, in.
P = Allowable working pressure, lb. per sq. in.

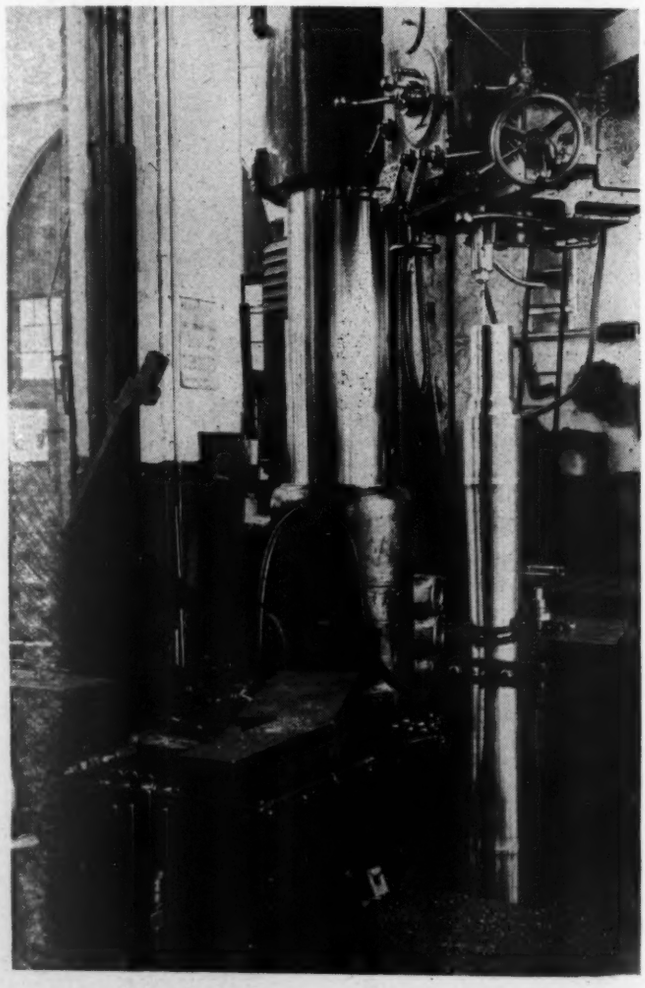
Preventing Embrittlement

Q.—Will the application of sodium sulphate to the boiler feedwater prevent plate embrittlement?—R.A.M.

A.—The application of sodium sulphate to the boiler feedwater is one of the methods used for the prevention of plate embrittlement. However, caution should be used as the addition of a large amount of sodium sulphate greatly increases the solids in the boiler water and a point is rapidly reached where foaming or carryover results. Any chemical treatment of the boiler water to reduce plate embrittlement should be made only after a careful analysis of the water has been made. The main constituents in boiler feedwater can be determined by simple tests, most of which can be conducted by anyone. Of course, after these tests are made, someone familiar with water treatment must interpret them. With instructions from qualified companies or individuals, the average engineer can soon become familiar enough with the testing of boiler water to recognize most of the ordinary conditions he will encounter in boiler feedwater treatment.

Drilling Axle Ends on a Radial

An unusual drilling job which is being done on a radial drill, as shown in the illustration, consists of drilling and tapping the end of a roller-bearing passenger-car axle for the application of a speed-governor adapter. Other types of machines could be used to do this drilling with the axle in a horizontal position, but, in this instance, the lower end of the axle is inserted in a shallow pit in the shop floor and the axle clamped in a vertical position against the radial drill work-table. The radial arm is elevated and the drill head and spindle brought into position, after



Set-up for drilling and tapping speed-governor adapter holes in passenger-car axle end on an American 6-ft. radial

which the necessary holes in the upper end of the axle can be quickly and accurately drilled and tapped.

This particular drill, an American 6-ft. radial, is equipped with three work-tables, an arrangement which has the important advantage of avoiding the necessity of breaking into one work set-up to accommodate one or more rush drilling jobs which may come to the shop and be scheduled ahead.

Grooved vs. Plain Driving-Box Bearings

*By A. E. Hickel**

Judging from the article by S.M.P., entitled "Grease Grooves in Driving Box Bearings," which appeared in the December *Railway Mechanical Engineer,* it is apparently not fully realized that these chamfered grooves are intended to distribute the grease film evenly over the journal-bearing surface. Experience and experiments have shown that grooves are not responsible for the loss of the grease as claimed. These greases will not spread longitudinally over ½ in. and if the grooves are stopped within ½ in. on each end of the brass, the grease film will be held in the bearing.

Any excess of grease working out of the bearing is not due to these grooves but is caused by the following conditions: (1) If the bearing has high spots, which cause local overheating, the grease will feed faster due to this condition. The excess grease thus produced has no place to collect and works out between the journal and the brass bearing, usually on the inside, i. e., the opposite end from the one next to the hub plate. (2) If the grease is too soft in consistency it will work out, as well as into the grease cellar. (3) If the grease is not properly manufactured, i. e., if it is made with too long a fiber, or if it is not aged long enough, or if it is not of the correct consistency, it will feed too fast, thereby creating great waste.

In normally conditioned bearings, properly fitted and using a grease of the right consistency and age, with a short grainy structure which will feed uniformly through the perforated plate, the waste of grease will be so small that it can be disregarded and the cake will last for thousands of miles. If, on the other hand, the grease is too soft or even if it is of proper consistency and becomes overheated due to mechanical conditions, considerable grease will work out, collecting in chunks as large as a man's hand before they drop off. Under these conditions, the cake containing the perforated plate is usually found lopsided in the cellar.

In a correct mechanical bearing, which has been properly packed, the excess accumulated grease below the lower part of the brass should be removed before a freshly trimmed cake of grease is charged. Under these conditions, the grease cake and perforated plate will always be found even and snug up against the journal bearing. Excessive grease in the box and cellar will not let the follower plate function properly and may prevent the grease cake from making contact with the journal bearing.

Some packers do not bother about removing the old accumulated grease when repacking and even try to slip a slab of grease between the follower plate of the cellar and the worn down cake, which is bad practice. Some others try to push the grease in with a hammer handle. Such packed bearings will not feed the grease uniformly and will extrude grease on the side of the perforated plate and eventually the grease will find its way into the cellar.

The writer doubts very much if grooving of these bearings has anything to do with grease loss or excessive consumption. The grooves do, however, reduce the total projected area of effective bearing surface, thereby increasing the pressure per square inch on the bearing and the grease film.

New bearings are usually fitted to form a large goose-egg contact pattern with the journal bearing and only about half or less of the actual contact area of the bearing is used when a new brass bearing is fitted. Experiments have shown that grooved bearings, lubricated either with oil or with grease, stand much higher loads and run cooler, due to proper distribution of the lubricating film.

A locomotive brass bearing, machined, scraped and polished perfectly smooth and without grooves failed in a short time after full load was applied. There is a vast difference between fitting a grease bearing of this kind, as compared to a plain oil bearing.

Friction always results either from actual abrasion or from the viscous or plastic resistance of the lubricant, especially at low speeds, while the viscosity of the lubricants in the compound plays the more important part at high speeds and under heavy loads. A thin or imperfect film of a poorly compounded grease allows metal-to-metal contact at low speeds, resulting in abrasion and high bearing temperatures, while the film of a grease having the proper consistency is continuous from the start, has better adhesion and is more uniformly distributed.

Excessive bearing temperature is a positive indication of the loss of power. The amount of frictional resistance to free motion offered by the bearings under different loads and varying speeds is measured by the increase in bearing temperature (frictional temperature) and, there-

* Consulting lubricating engineer, Chicago.

Test locomotive with temperature recording chart mounted on left running board back of the air compressors

fore, the lowest bearing temperature indicates lowest coefficient of friction and the best lubricant.

A high grade driving-journal compound should lubricate all classes of locomotives. It must be homogeneous and of uniform consistency, and contain no fillers, free fat, nor an excessive amount of free alkali and very little moisture. Such a grease, if properly aged, will not carbonize readily, get soft and spongy, or melt out.

The fusing or melting point should be sufficiently high to prevent too much softening or sponging. Too soft a grease will get spongy and adhere to the journal bearing, thereby causing excess frictional heat and excessive consumption; on the other hand, the fusing point of the grease should not be too high, for if the grease does lubricate and feed properly, the working temperature of the journal bearing will never exceed the fusing or melting point of the grease.

The consistency (hardness) of the grease should not increase excessively due to the heat of the journal bearing. Results obtained from various tests indicate that a grease that consumes the least power, i. e., has the lowest coefficient of friction, will also have the lowest bearing temperature and usually give the greatest mileage.

Practical test runs made on a Pacific type locomotive with booster, used in passenger service, starting from a point in Kansas at zero and sub-zero temperatures and running to a southern city having a temperature of about 55 deg. F. to 65 deg. F. temperature, a distance of 652 miles each way, showed the following results: Two driving journal bearings were tested on each round trip (1,304 miles). The front wheel bearings were tested first, then the main bearings and the rear wheel bearings last. The size of the main bearing was 11 in. by 19 in. and the others 10 in. by 12 in. Pressure per square inch of projected area of effective bearing surface was 180 lb. The total load on journals in pounds (weight on drivers) was 167,000 lb. The weight of the cakes (without plates) was a trifle over 10 lb. for each cake. Two greases were tested, one on each side of the locomotive. On the left side, the three bearings were lubricated with a grease ordinarily used in service, and the three bearings on the right side were lubricated with a grease which contained a higher viscosity oil than normally used in these greases. The soap content of the two greases was about the same. All brasses were grooved according to standard practice.

Due to difficulties encountered in making a permanent hook-up, speedometer readings were taken only part of the time, but atmospheric temperatures and elevations of the right of way were noted for each run. Each brass was fitted with a thermocouple and connected to a recording instrument mounted on the running board of the locomotive just outside the fireman's window, as shown in the illustration. Three round trip tests were made with results shown in the table.

These test runs were made during the holiday season and the trains had more than the usual number of coaches.

Journal Grease Test Results—Three Round Trips

	Left-side bearing temperature, deg. F.	Right-side bearing temperature, deg. F.
Front drivers	191.8 southbound	171.9 southbound
	197.5 northbound	184.7 northbound
Main drivers	207.2 southbound	209.0 southbound
	199.2 northbound	227.2 northbound
Rear drivers	202.8 southbound	193.7 southbound
	178.4 northbound	187.3 northbound
	196.1 Average	195.5 Average

The average bearing temperatures for each set of wheels were as follows: Front wheelbearings—186.0 deg. F.; main bearings—210.6 deg. F.; rear wheelbearings—190.5 deg. F.

The speed was around 50 to 55 miles an hour and on one stretch 70 to 72 miles an hour, but this increase of speed, due to its short duration, did not cause any change in bearing temperature.

It was observed that during a stop for water or unloading express (15 to 20 minutes) the bearing temperatures dropped from 20 to 30 degrees, each time, and that it took nearly half to three-quarters of an hour for the bearing to go back to its original running temperature.

The temperature recording chart, illustrated, is one of the six charts made. The left bearings were recorded with green ink and the right bearings with purple ink. The swaying of the locomotive had a tendency to move the recording needle on the chart somewhat higher than the actual temperature indicated.

After all tests were made, the runs were plotted, showing bearing and atmospheric temperatures, speed in miles an hour, elevation for the 652 miles of right of way, etc.

Examination of the grease cake, journal bearings and cellars showed perfect lubrication after 5,389 miles; little waste of grease due to working out between the journal and the brass bearing, and low consumption.

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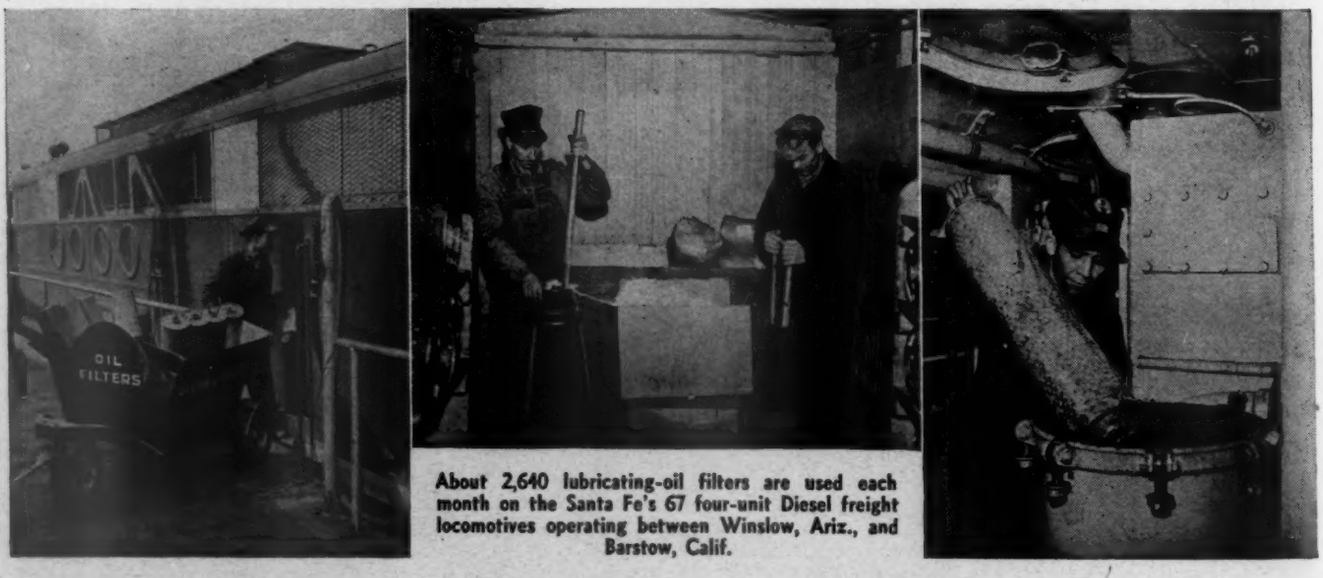


About 2,640 lubricating-oil filters are used each month on the Santa Fe's 67 four-unit Diesel freight locomotives operating between Winslow, Ariz., and Barstow, Calif.

Left: Service cart used in transporting filters at Winslow enginehouse—Center: How new packing is applied in the filters—Right: Inserting a cleaned and renovated filter unit in the locomotive

Shape-Cutting Template Rack

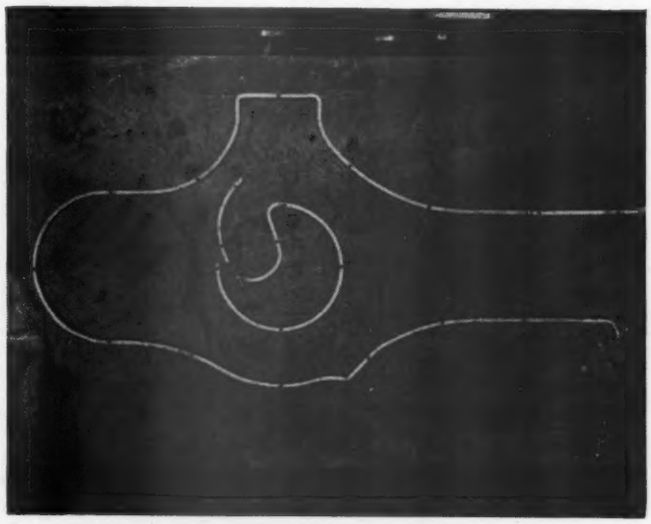
The unusually neat and large-capacity shape-cutting template rack, shown in one of the illustrations with a side-rod template leaning against the front of the rack, is used at the Texas & Pacific locomotive shops, Marshall, Tex.

The idea of this rack is to supply a safe place where the large number of templates required for this work can be kept and easily removed or replaced without danger of bending or breaking the aluminum tracks which serve as a guide for controlling movement of the cutting torch. All are numbered, with corresponding numbers shown in numerical order on corner posts opposite the rack spaces.

Referring to the illustration mentioned, the construction of this rack will be apparent. It is made in three main sections, one 50 in. wide and each of the others 33 in. wide, all sections being 6 ft. high by 10 ft. long. The corner posts of each rack section are made of 1¼-in. pipe, to which ½-in. round steel rods, spaced 1⅝ in. on centers, are welded horizontally. The back of each rack section is made like the front and a similar intermediate welded construction supports the inner end of short templates or long templates at the center. The rack sections are kept vertical and rigid by diagonal pipe braces.

With the horizontal rod spacing used, each rack section can accommodate about 42 templates. The two sections at the right are used almost exclusively for locomotive driving rod templates and the wide section at the left is used for drawbar, equalizer and valve motion templates.

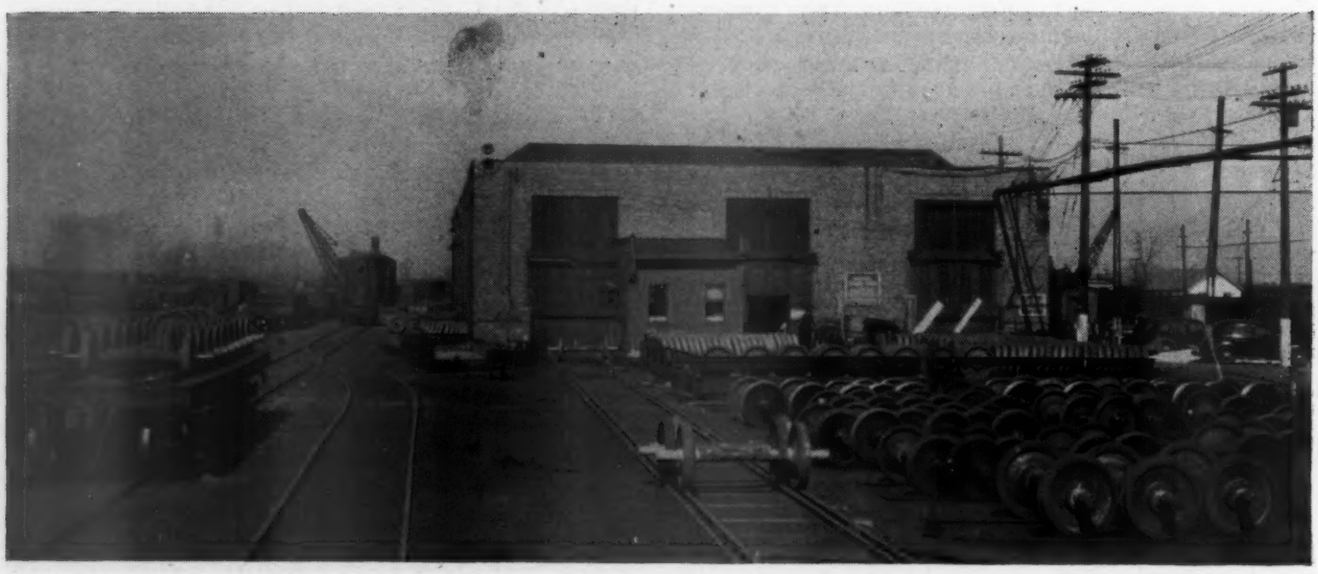
Referring to the second illustration, the ingenious method used in leading the cutting torch accurately into the required path for cutting out rod center holes is shown. A short section of the circular aluminum track is simply swung out of position, as illustrated, and the S-section pivoted until it makes a smooth connection with the rest of the circle near the top. A hole is lanced near the center of the rod hole and the cutting torch moved into position over it, with the pair of guide driving trunnions straddling the aluminum track. Operation of the machine then causes the torch to cut an S-shape path into the regular circle cut. When this is reached, the S-section track is simply swung out of the way and the circle segment pivoted back into position so that, when the guide trunnions get around to this point, the torch completes an accurate, full-circle cut.



A side-rod template showing S-shape aluminum track leads into the center circle cut

Welded shape-cutting template rack which avoids template damage and conserves floor space at the Marshall shops of the Texas & Pacific

With the Car Foremen and Inspectors



Markham car-wheel shop of the Illinois Central

Wheel Shop Practices*

By F. J. Holsinger †

In an effort to avoid train delays and shopping of cars for wheel and axle defects, a joint mechanical committee of the Association of American Railroads directed that a check be made of various wheel shops, both railroad and private lines in the Chicago area, to determine if the standards set forth in the A. A. R. Wheel and Axle Manual were being followed. Their investigation of the wheel shops resulted in finding many violations of A. A. R. standard requirements.

The greatest contributing factor in delays to trains was hot boxes, and in the course of the committee's investigation of wheel shop practices they found wheels mounted as much as 5/16 in. out of gage; wheels condemnable by remount gages, on account of high flanges and badly worn flanges; journals improperly machined; end collars as much as 1/8 in. too high; journals elongated to the extent that they should have been scrapped, and journals on new axles not machined according to A. A. R. specifications, with improperly finished journals, collars and fillets.

In one of the shops visited, the committee found machinery in such condition as to require the placing of liners between the wheel and the boring mill jaws; wheels being bored as much as 1/4 in. eccentric. Many of the tools used on boring mills and lathes in no way conformed to wheel and axle manual requirements, and when used would not produce a reasonably good job.

The mounting and wheel-centering gages were not A. A. R. standard; wheel seats were not being properly machined, such as turning them back 3/8 in. to permit proper measurement. Journals were not being machined where they were tapered and had rough back and front fillets.

This committee found a number of wheels being mounted out of gage either due to diagonal bore, eccentric bore, or mounted through the use of worn and non-standard mounting gages. They recommended that boring mills be checked daily to see that they are in condition to perform proper machining.

They also recommended that the accuracy of the work done on axle lathes be checked by boring mill operators to report when any taper or out-of-roundness approaches .002 in. and that bores of a few finished wheels be checked daily with the same limits for correction.

Accurate machining is as important in finishing axles as in boring wheels. There are three factors to be considered; the accuracy of machining as it affects the pressure fit between the axle and the wheel; the quality of the

* Paper presented at the September 21, 1945, meeting of the Southern & Southwestern Railway Club and the February 19, 1946, meeting of the Car Department Association of St. Louis.

† Wheel shop foreman, Illinois Central, Markham Yard, Hazel Crest, Ill.

finished surface as it may affect the formation of fatigue cracks in service; and the quality of the finished surface of the journal as it may affect journal wear and possible hot boxes.

A thorough investigation of the gages, tools, machines and workmanship of the Markham wheel shop of the Illinois Central was made and we were proud to receive an A-1 rating from the committee. As everyone knows, or should know the rules in the Wheel and Axle Manual, I will not attempt to quote them, but will try to give a brief outline of the routine in our shop.

Operations at the Markham Wheel Shop

All scrap wheels received at our shop are put on a standard double wheel track with rails 6 in. apart, where they are inspected and marked as to whether they are scrap or second hand.

This track leads directly to our stripping press, where wheels are dismounted, the scrap wheels going into an automatic lift that conveys them to a chute 150 ft. long with 10 gates making it possible to separate steel wheels from cast iron wheels.

These wheels are loaded into cars by a magnet crane to be returned to foundries, eliminating the hazardous handling by hand.

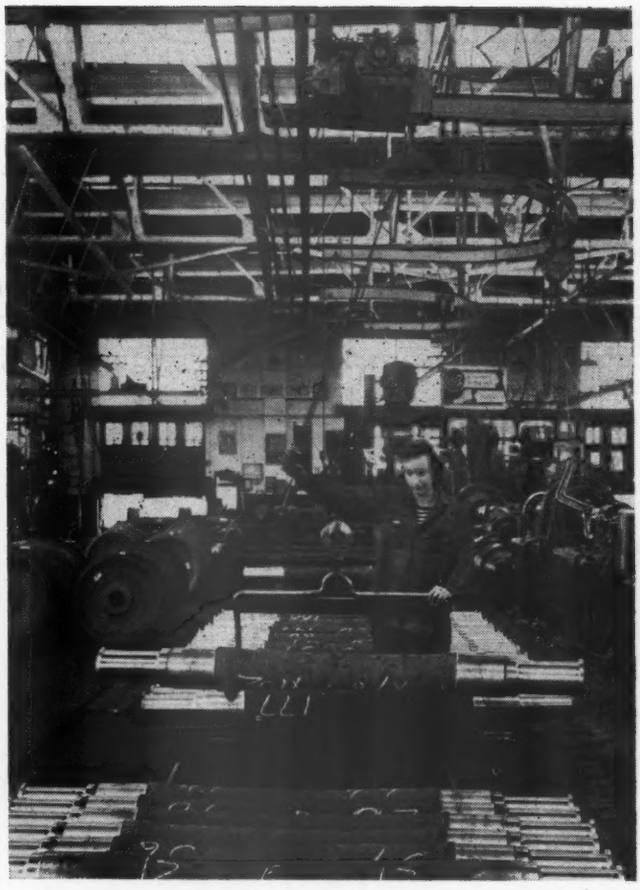
We have an axle conveyor that works on the same principle as the wheel chute by which we can separate the surplus second-hand axles into rows of different sizes and discard the scrap axles. The second-hand axles are carried from the stripping press by electric hoist crane to the axle lathe bench, which will hold 12 axles with enough room on both sides for inspection and drilling of center holes when necessary.

We have a portable clamp that fastens back of collars with which we use a combination counter sink and drill for the lead hole for recentering.

All of our axle lathes are equipped with gages for checking journal length and diameter, cutting the shoulder back to make it possible for inspection of wheel seat and for measuring radius of fillet.

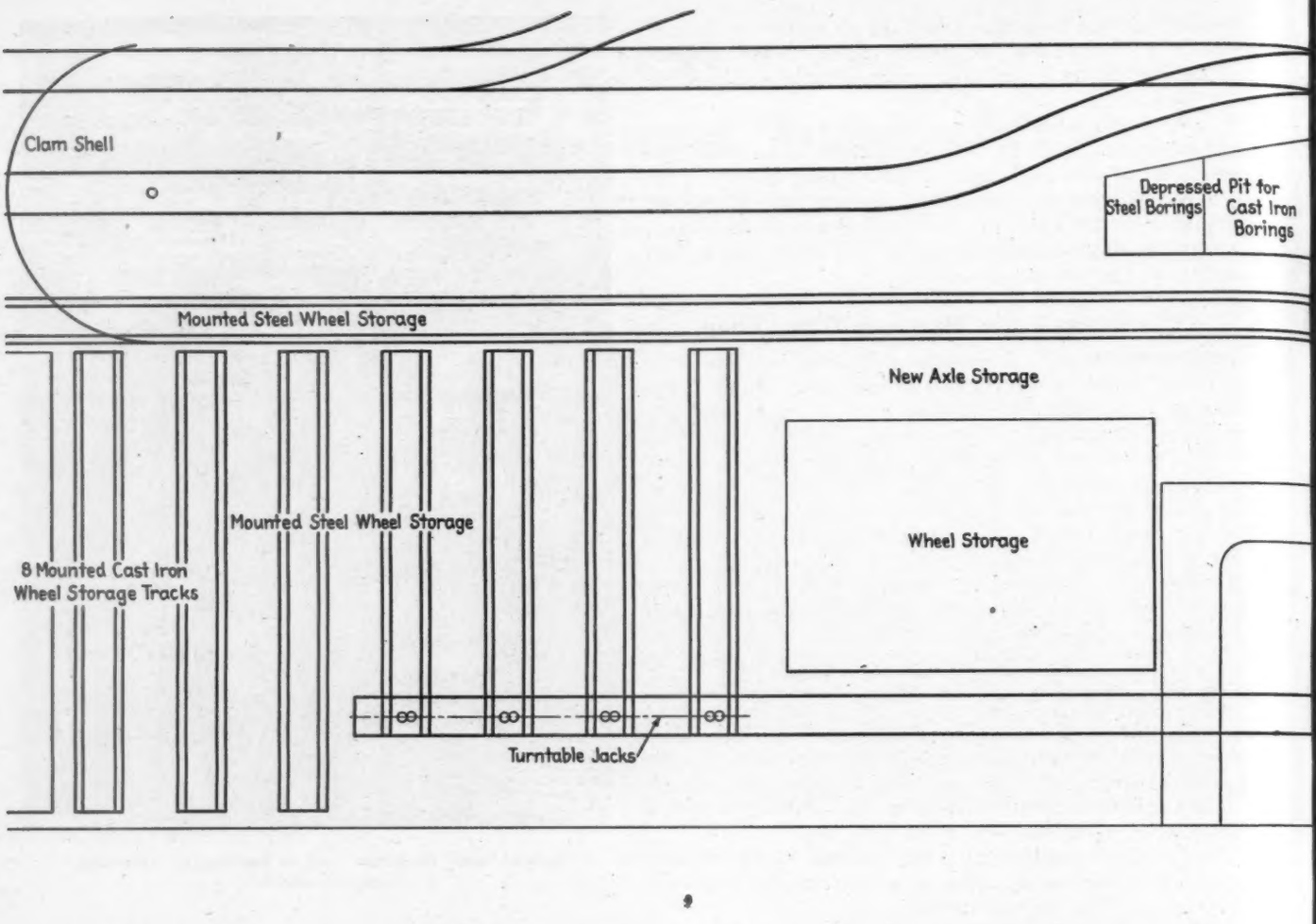
Lathes are equipped with tool post turrets and permanent tool holders, making it necessary to remove only tool bits for sharpening. Most of the lathes are equipped with live centers, and those that are not are coated with stellite.

The practice at Markham is to turn all wheel seats,



Monorail hoist equipment used in handling car axles and mounted wheels

Axle rails and special device for recentering car axles



Markham wheel-shop layout with machine location shown

The safety bulletin board helps keep the men safety minded

journals, and end collars. The wheel seats are turned the same size on the individual axles so as not to confuse the man on the boring mill that handles the micrometers.

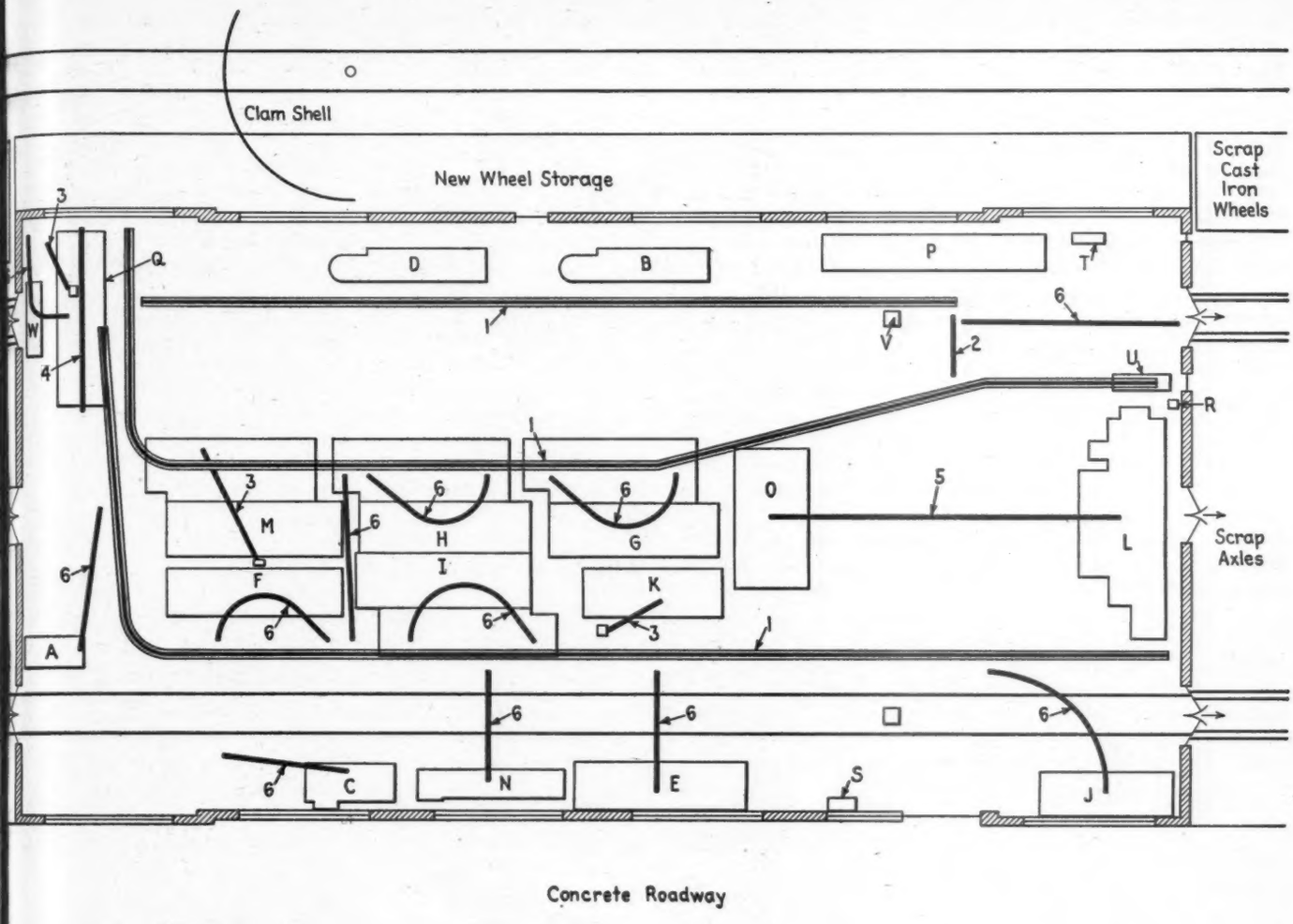
All axles are checked for seams and cracks before they are placed on a rack to be moved to the burnishing machine; all center holes are ground on the surface with a portable grinder to remove burrs and roughness before being put into the burnishing machine, then they are placed on tracks leading to the wheel press to have the wheels mounted.

All new wheels are hauled to boring mills with a self-loading and unloading hand truck, especially built for this purpose, as shown on page 22 of the January Railway Mechanical Engineer, which will haul wheels up to 40 in. in diameter; the man doing this work is 63 years of age which shows how easy this truck is to manipulate and does away with the hazardous practice of rolling wheels by hand and overcome the problem of man-power shortage in this particular phase of the work.

Boring Mill Jaws Are Kept True

The boring mills are checked every Monday morning with a dial gage and ground true with a portable grinder fastened to the Davis bar. We find the grinding necessary about twice a year when other repairs are made to the jaws.

After the jaws have been ground, a pair of wheels is bored, mounted and tested in a gap lathe equipped with live centers to see if the wheel is perfectly true; all wheels



shown by letter and monorails by numerals

Monorails

1—Electrified monorail for hoisting and traveling operations
2—Monorail with hoist block, manually operated
3—Pillar crane with manually-operated hoist
4—Monorail with two hoist blocks manually operated and one electric hoist manually traveled
5—Monorail with air hoist
6—Monorail with electric hoist block

Non-Portable Power-Driven Machines

A-D—54-in. Niles boring mill
B—54-in. Putnam boring mill
C—54-in. Sellers boring mill
E—30-in. by 15-ft. Niles combination axle lathe
F-G—30-in. by 14-ft. Putnam axle lathes
H-I—30-in. by 14-ft. Niles axle lathes
J—30-in. by 14-ft. Putnam combination axle lathe
K—40-in. by 93-ft. Sellers combination axle lathes (new)
L—42-in. Sellers car-wheel lathe
M—14-in. by 9-ft. Niles burnishing lathe
N—18-in. by 8-ft. Boye & Emmes engine lathe
O—24-in. Norton car-wheel grinder
P—48-in., 500-ton Niles car-wheel stripping press
Q—48-in., 500-ton Watson-Stillman car-wheel press
R—10-in. tire-tool grinder
S—18-in. Hisey-Wolf double-end floor grinder
Other facilities
T—Wheel elevator
U—Axle elevator —
V—Air jack
W—Shift table

are bored within the limits of A.A.R. specifications and micrometer measurements are marked on wheels and axles to correspond.

The wheels are rolled to the mounting press by press operators who apply a coating made up of pure white lead and linseed oil. The proper mixture of this coating is an important factor in wheel mounting, as a wrong mixture can cause many misfits.

We use 12 lb. of white lead to one gallon of boiled linseed oil as instructed in the manual; however, this mixture should be tested daily with a heavy liquid hydrometer and made fresh at least once a week as it thickens which will make changes in the wheel pressures.

All gages used at the mounting press are checked each Monday morning with master gages and when found to be out of gage, are built up with stellite.

We keep an extra recording gage on hand to be used in case of emergency and for making repairs needed to the one in use.

As each pair of wheels is mounted, the wheel numbers, date cast, capacity and initials of mechanic boring the wheels are shown on a recording chart in case any checking back on wheels mounted is necessary.

Axles are centered by a marker gage with a dull point so as not to deface the center of the axle or cause a progressive fracture. We have a separate solid gage for each class of axle. Guards are put on journals before wheels are placed on axle; they are then rolled into the press where both wheels are pressed on without turning the axle.

The axle is pressed into the first wheel and the second wheel is pressed on the axle, after which the wheels are gaged at three points with an over-all gage.

The journals are then greased and wheels leave the shop

on a standard wheel track for loading by locomotive crane; or they can be turned on an air jack in the center of the track and rolled back into the shop to be ground or tested for roundness.

Wheel Press Operated with Oil

Our wheel press is operated with oil in place of water. We find this much better as it lubricates the valves, keeps the leathers soft, and protects the plunger sleeves.

For stripping motor car wheels, Spicer drives, and other special wheels with gears on axles, we have a jib crane, also a monorail with suspended hoist to handle heavy tools. With this equipment a mounting press can be changed over to a stripping press which is often helpful as many wheels cannot be dismounted on regular stripping press.

We are able to reclaim a great many cast iron wheels that have slid flat spots by putting them in a Norton grinder. We also grind cast iron wheels for application to cabooses. All steel wheels for streamline trains are put through this grinder and balanced.

We use new axles for passenger service when available. When second-hand axles with new dimensions are used, they must be tested for cracks with a Magnaflux machine; also, wheels with cut or discolored journals.

It is my opinion that all wheel shops should be equipped with Magnaflux equipment and have all axles, both for freight and passenger use, pass through this machine before being mounted, as there are cracks that cannot be detected by ordinary inspection.

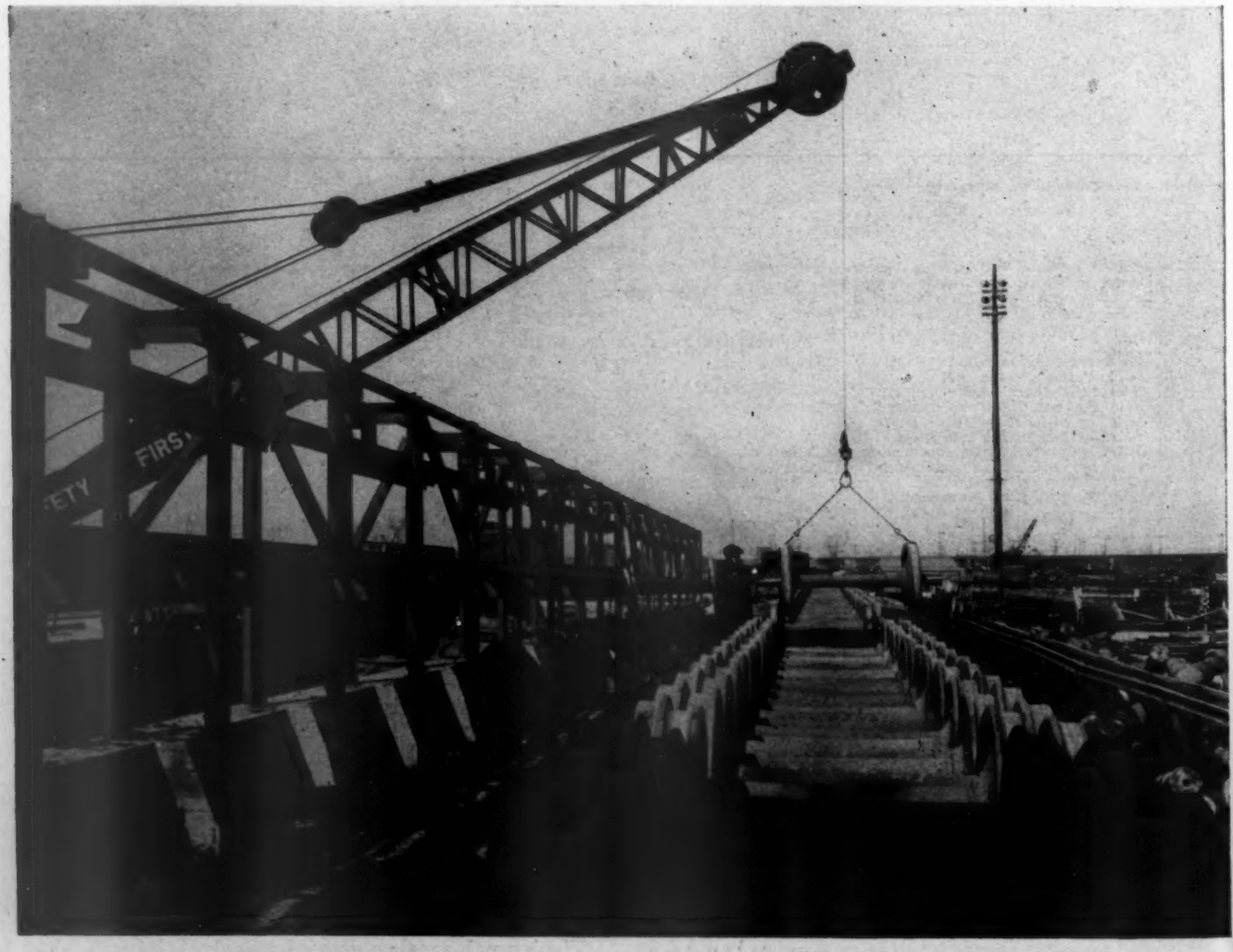
In checking axles on Diesel switch engines, we have found that 59 out of 60 were cracked. The cracks were between the gears and the wheel fit, some of which were all the way around the axle and as deep as 3 in. Now we have redesigned the axles by doing away with the fillet and cutting a straight taper about ¾ in. in length, equally divided between the gear and the wheel. Later Diesel axles are purchased with the gear dove-tailed to overcome this defect. We also have found cracks in streamline locomotive axles, but no cracks have been found in the streamlined car axles that have been Magnafluxed.

Nearly all steel wheels are bored by one boring mill which is equipped with a larger Davis bar; this eliminates chatter by using shorter tools and works out satisfactorily in boring wheels of the larger sizes up to 9 in. bore.

All coach wheels are turned in a lathe and taped for size after the wheels are finished; we do not depend on the measuring attachment on the lathe as we have found many 36-in. wheels out as much as three tapes, and it has been proven that if a wheel is out one tape, the smaller wheel must travel 9½ ft. further for each mile, thus causing sharp flanges and also contributing much to hot bearings.

Wheels Tested for Concentricity and Balance

All wheels are then placed in a gap lathe and the journals and wheels are tested for concentricity and balance. We have found a number of wheels with treads turned that were as much as ⅛ in. eccentric although they were the right tape size; this condition is caused by the material in the wheels being harder in some spots which is mostly caused by slid flat spots.



Scrap-wheel runway (on the left) and crane used in unloading wheels preparatory to rolling into the shop

These wheels are placed in the grinder and ground true before they are put out for service.

Our tool holders are made from tire steel and a pin insert tool is used for rough turning which has greatly reduced cutting tool costs.

All wheels for streamline trains mounted in our shop are balanced and ground but not turned, as this is done in the Diesel Shop where we have a later type machine and the turning can be done without removing bearings.

Car End Jacking Frame

A relatively light, but strong, movable steel frame, used in straightening bulged car ends by jacking, is shown in the illustration as it is being placed in position for operation on the repair track.

Each side of the frame consists of a 14-in. by 12-ft. channel with an 8-in. diagonal bracing channel welded to the top and joined at the bottom by a 1½-in. by 4-in. by 7-ft. tie bar. The sides of the frame are spaced far enough apart so they will rest on the rails and give a firm foundation for jacking. They are held in position with respect to each other by suitable top and bottom cross-ties and cross bracing.

The top angle-iron cross-tie carries at the center a chain block, installed so that the lifting chain supports a substantial vertically sliding cross member which may be easily raised to any elevation desired and serve as a support for the jack base.

In jacking a bulged car end, this steel frame is simply placed on the rails, chained to the car truck wheels or coupler and preferably a power-operated jack used to straighten the car end. The easiest method of handling this jacking frame is by means of a crane-equipped truck.

Air Brake Questions and Answers

HSC Equipment on Passenger Cars and Diesel A and B Locomotive Units Brake Application

OPERATION OF THE AUTOMOTIVE BRAKE VALVE

380—*Q.—Is this reduction controlled by any means?* A.—Yes, the reduction is controlled to the standard rate by choke *61* in the M-2 brake application valve.

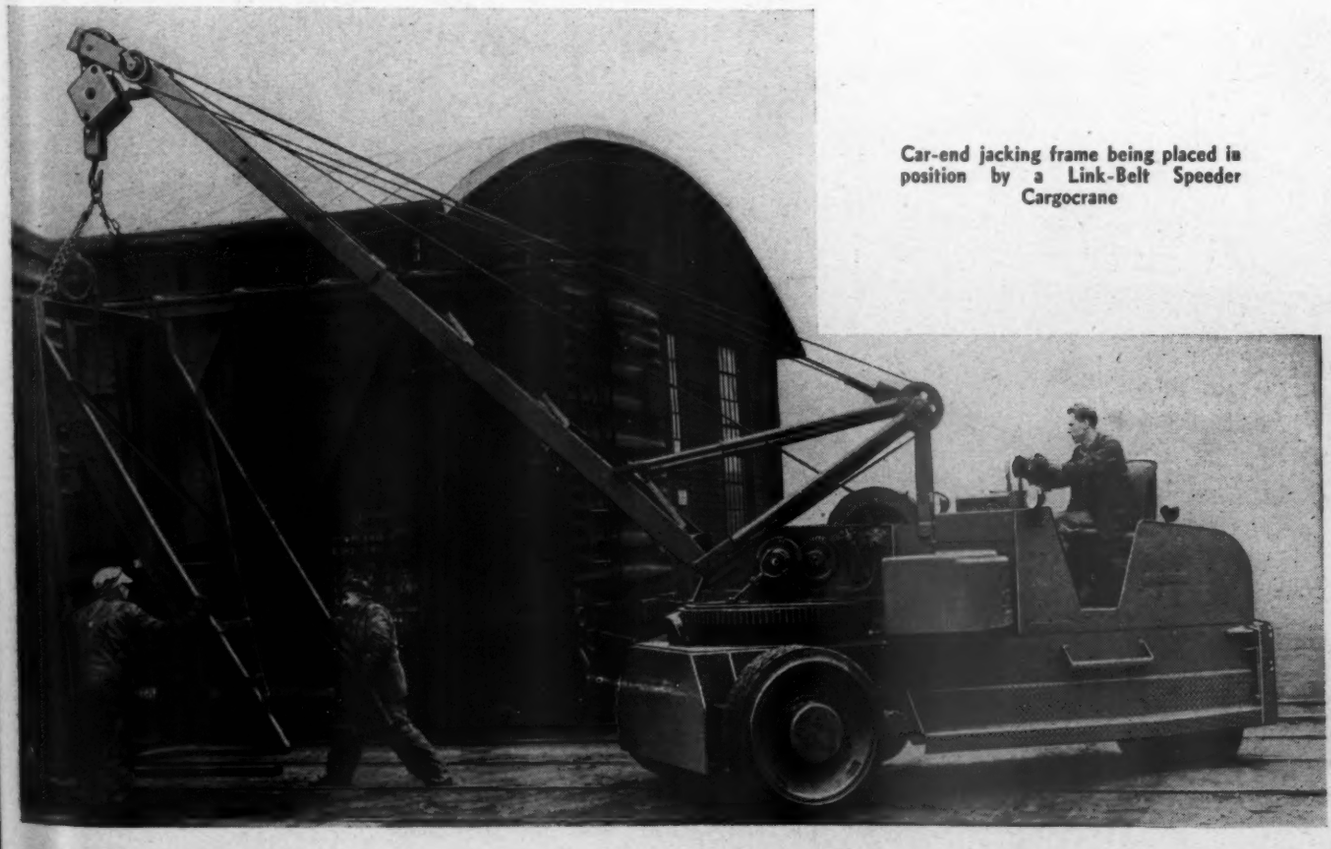
381—*Q.—Is the brake valve exhaust open in release position?* A.—No.

382—*Q.—Why is the exhaust closed in this position?* A.—To prevent loss of brake pipe air due to unseating the equalizing valve when releasing, by reason of the brake pipe charging faster than the equalizing reservoir.

383—*Q.—What terminates the brake pipe reduction?* A.—As soon as the brake pipe pressure is reduced slightly below that in the equalizing reservoir, the equalizing piston *42* is moved back and closes the discharge valve *44*, thereby terminating the brake pipe reduction. Thus, the brake pipe pressure is reduced the same amount that equalizing reservoir pressure is reduced.

384—*Q.—In first service position of the MS-40 brake valve handle, how is the equalizing reservoir port connected to the brake valve exhaust?* A.—The rotary valve *54* connects equalizing reservoir port *4* directly to the brake valve exhaust so that equalizing reservoir may be reduced the amount desired, the equivalent brake pipe reduction being obtained at a normal service rate by operation of the equalizing piston valve in the M2 brake application valve as described under first service.

385—*Q.—How is the equalizing reservoir pressure connected to atmosphere in emergency position?* A.—In emergency position of the brake valve handle, the rotary valve makes a large direct connection between the equalizing port *4* and the brake valve exhaust, permitting equalizing reservoir air to reduce rapidly to zero.



Car-end jacking frame being placed in position by a Link-Belt Speeder Cargocrane

386—*Q.—What actuates to create an emergency rate of reduction in brake pipe pressure on the locomotive?* A.—A handle cam unseats emergency valve *10* and its pilot valve *12*, opening the brake pipe directly to the exhaust, creating an emergency rate of reduction in brake pipe pressure on the locomotive.

387—*Q.—In automatic service how do the D-22-ER and D-22-BR control valves operate in comparison with the D-22-AR control?* A.—They operate like the D-22-AR, as the service and emergency portions of the three valves are the same.

388—*Q.—How are the ports connected to the displacement reservoir and the application and release portion in the D-22-ER control valve?* A.—The service port *3b* connects through the filling piece passages *3a* and *3* to the displacement reservoir and to the lower face of double check valve *263* in the application and release portion. In automatic brake applications, the displacement reservoir pressure moves double check valve *263* to its upper seat and connects passage *3* to passages *16c* and *16*, thence to the FS-1864 relay valve which reproduces brake cylinder pressure as adjusted by the speed governor.

389—*Q.—What closes off the independent application and release pipe and the straight air pipe?* A.—The upper seat of double check valve *263* seats, sealing off passage *16d* which closes the independent application and release pipe *20*, and the straight air pipe *8*. In the D-22-BR control valve, the double check valve *228* is moved to its left-hand seat, closing off the straight air pipe and opening connection between service port *3a* to relay passage *16a*.

390—*Q.—In the event that the speed governor is not used, is the same braking ratio provided as in steam road service?* A.—Yes.

391—*Q.—Explain the set-up.* A.—The F-1864 or FS-1864 relay valve is conditioned as shown in Fig. 28 and 32 with all magnets de-energized. The *H* and *M* magnets open diaphragm cavities *P* and *N* to inshot pressures only, while application air from passage *16* flows past lower L.S. magnet valve *161a* to passages *17* and *17a*, and to diaphragm cavity *K*, where it is effective on diaphragm *64*. This is the 60 per cent diaphragm, and the relay portion operates to produce this ratio of brake cylinder pressure to displacement reservoir pressure built up in cavity *K*.

392—*Q.—What does this permit?* A.—The maximum braking ratio thus produced corresponds to standard steam road practice which permits interchange of the locomotives and cars in standard road trains.

Operating Instructions—Electro-Pneumatic Brake System

393—*Q.—Before starting the locomotive engine, what should be known?* A.—That all reservoir drain cocks are closed.

394—*Q.—What should be done next?* A.—Close the electric switch in the supply line to the application and release magnet circuit. With the brake valve shifter

* * *

Krane Kar acquired recently by the Delaware & Hudson for its Oneonta, N. Y. car shops

lever in straight air position, depress and move the MS-40 brake valve handle to full self-lapping application position and hold either the foot pedal or the brake valve handle depressed.

395—*Q.—How long should the foot pedal or brake valve handle be depressed?* A.—Until the brake cylinder pressure builds up to approximately 25 lb., after which both the foot pedal and brake valve handle may be released.

396—*Q.—When ready to move the train, how is the application released?* A.—First depress the foot pedal of the diaphragm foot valve, or with the MS-40 brake valve handle held down, move the handle to release position.

397—*Q.—What precaution must be observed in regard to the foot pedal and the brake valve handle?* A.—It is important that either the brake valve handle or the foot valve pedal be held down at all times unless a brake application of approximately 25 lb. is made in order to prevent operation of the safety control feature.

398—*Q.—What further precaution should be taken before putting the train in motion?* A.—Train should not be put in motion with less than 125 lb. main reservoir pressure, and it should be ascertained that all hand brakes are released.

399—*Q.—In what position should brake valve handles be held when train is running and brakes not being operated?* A.—Both handles should be kept in release position with either the MS-40 brake valve handle or foot valve pedal held down while the train is running and brakes not being operated.

400—*Q.—What should be done in the event of sudden danger?* A.—Move the brake valve handle from whatever position it may be into *emergency* position, at the extreme right, and leave it there until the train stops and the danger is past.

401—*Q.—In the event that the brakes apply while running over the road, what should be done?* A.—If the brakes apply while running over the road due to a rupture of the brake pipe or a conductor's valve operation, move the brake valve handle to *emergency* position at once to prevent unnecessary waste of main reservoir air. After the train stops the cause of the application should be located and remedied before proceeding.

402—*Q.—When making a stop in service how are the brakes applied?* A.—By moving the brake valve handle to the right.

403—*Q.—Upon what does the amount of brake application depend?* A.—The distance the brake valve handle is advanced toward full self-lapping application position.

404—*Q.—How is the shortest stop accomplished?* A.—The *shortest* stop is accomplished by applying the brakes at the start as hard as speed, rail and grade conditions permit and then graduating off as train speed decreases, by moving the brake valve handle gradually to the left, the train finally being brought to rest with only enough brake cylinder pressure retained to prevent it from moving.

405—*How is the smoothest stop accomplished?* A.—The *smoothest* stop is accomplished by making an initial light application to adjust the slack, then follow with the necessary additional application and graduate off as the train comes to a stop.

406—*Q.—Is it necessary to "fan" the brake valve handle in graduating off, as is the case with steam locomotive brake valves?* A.—As the brake valve is self lapping, it is not necessary to "fan" the handle in graduating off.

407—*Q.—What is the advantage of this feature?* A.—This feature gives the engineman a sensitive "feel" of the train, enabling him to graduate off and avoid wheel sliding under bad rail conditions. With speed governor control in effect it operates to limit maximum brake cylinder pressures in accordance with speed.

408—*Q.—In the event that brake cylinder pressure fails to respond properly to brake valve handle manipulation, what must be done?* A.—Move the handle to *emergency* position.

409—*Q.—Referring to safety control, what will be the result if both the brake valve handle and the foot valve pedal be released without approximately 25 lb. brake cylinder pressure in effect?* A.—A service application will result through operation of the safety control feature.

410—*Q.—What must be done to release a safety control application?* A.—Depress the brake valve handle or foot pedal and pause midway in the self-lapping application zone (automatic lap position) before releasing.

Scrap Handling At Aurora Shops

The special overhead crane and hoist shown in the illustrations are employed in loading scrap into low-side gondolas at the Aurora, Ill., shops of the Chicago, Burlington & Quincy. Several such cars are regularly assigned to moving the scrap from the shops to the Eola reclamation plant.

The cars are set on a track underneath the light overhead traveling crane equipped with an electric hoist. Scrap is collected in the special buckets which are strategically located throughout the shop and, when filled,

Scrap bucket just after being tipped to drop a load of steel chips into the car

moved by a lift truck to the scrap car. The scrap bucket itself consists of a 20-in. by 40-in. by 60-in. light steel box which is supported on a skid frame with legs long enough to permit entrance of the lift-truck platform underneath.

On the bucket ends, centrally located but well below the center line, are two projecting lugs designed to engage detachable hooks on the 2¼-in. round lifting yoke, suspended from the overhead crane. With the lifting yoke in a vertical position, a hinged steel plate, slotted at the center, is arranged to be dropped in place and hold the scrap bucket right side up while being lifted over the scrap car. When in the desired position, this plate is pushed up by a man standing on the ground at the side of the car, using a light wood pole, and the bucket empties itself into the scrap car.

In the broadside view of the scrap car, a loaded scrap bucket is shown at the left ready for lifting into the car and one which has just been emptied is standing at the right. Between these is a different type of bucket with an inclined runway used in unloading scrap which for one reason or another may be collected in a wheelbarrow, pushed up the plank runway and tipped over into the bucket. This bucket is unloaded into the scrap car in the same manner as the rectangular bucket previously described. The second illustration shows a rectangular scrap bucket which has just been tripped and emptied into the scrap car. The hinged steel locking plate is clearly shown in the release position in this view.

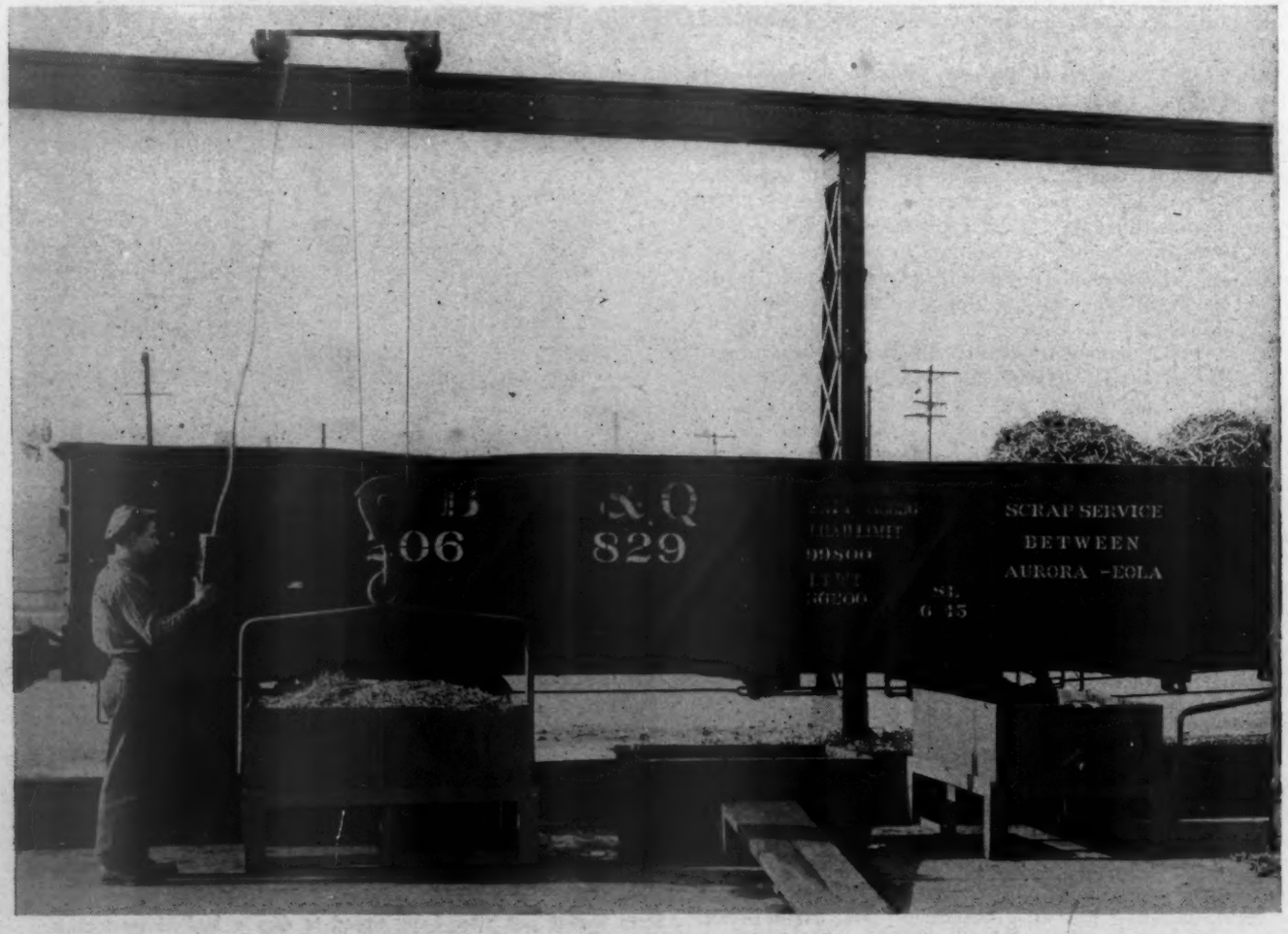
These rectangular scrap buckets with their supporting skids are painted a light grey and present an attractive appearance in the shops where they are used. They practically eliminate manual labor in handling scrap at Aurora shops and, moreover, permit segregating the various materials which are placed in the scrap cars in such a way as greatly to facilitate unloading and subsequent handling on receipt at the Eola reclamation plant.

Old Defects Found After Cars Are Repaired

In a circular letter dated March 5, Vice-Chairman V. R. Hawthorne, of the A.A.R. Mechanical Division, reports continued intermediate shopping of loaded cars because of old defects that evidently existed when the cars were loaded. In many cases, stenciling indicated recent release from other shop tracks.

Railroads are again urged to issue the necessary instructions, and to see that they are carried out, to the end that when cars are on repair tracks (especially while empty) particular attention be directed to thorough inspection and necessary repairs to couplers, draft gears and attachments, truck sides and bolsters, brake beams, safety supports; brake boards, roof safety appliances; to other defects hazardous to safe train operation and to defects in violation of Interstate Commerce Commission regulations.

The vice-chairman suggests that supervisory forces be required to provide for closer inspection both prior to and following shop repairs, and after inspectors and repair men at freight houses and in yards, in order that subsequent shopping due to overlooked defects and because of neglected and therefore aggravated minor defects, be avoided.



Scrap bucket ready for loading into a scrap car at the Aurora shops of the C. B. & Q.

ELECTRICAL SECTION

Permanent Radio Installation

Baltimore & Ohio uses radio train communication in its New Castle yard to improve operations formerly hampered 200 days a year by heavy fog

A PERMANENT installation of VHF (very high frequency) AM (amplitude modulation) radio for two-way conversation has been installed at the New Castle Junction, Pa., yard of the Baltimore & Ohio. It is used for conversation between the westbound hump shanty and locomotives operating on the westbound hump and in the westbound receiving and dispatching yards. A frequency of 159.27 megacycles was allotted for this installation by the Federal Communications Commission.

The diagram shows the westbound hump and the westbound receiving and dispatching yards, located north of the eastbound receiving and dispatching yards and the main line. Entrance and exit to the yards from the main line are at UN tower at the east end and OA tower at the west end. The Un tower is located 0.8 mile east of the westbound hump shanty, while OA tower is located 1.1 miles, west of the shanty. From UN tower eastward, the main line extends to Pittsburgh, Buffalo, Rochester, Washington, Baltimore and Philadelphia. At OA tower, there is a junction with the Pittsburgh & Lake Erie extending to New Castle. The B. & O. main line extends west to New Castle, Youngstown, Akron, Cleveland, Toledo and Chicago. The westbound yards and hump are the most important. Westbound freight trains are brought into the westbound receiving yard at UN tower, and are broken up, humped and classified for further movements to points west. Eastbound trains are handled in a similar manner, but not on as large a scale, and radio communication is not used in the eastbound yards.

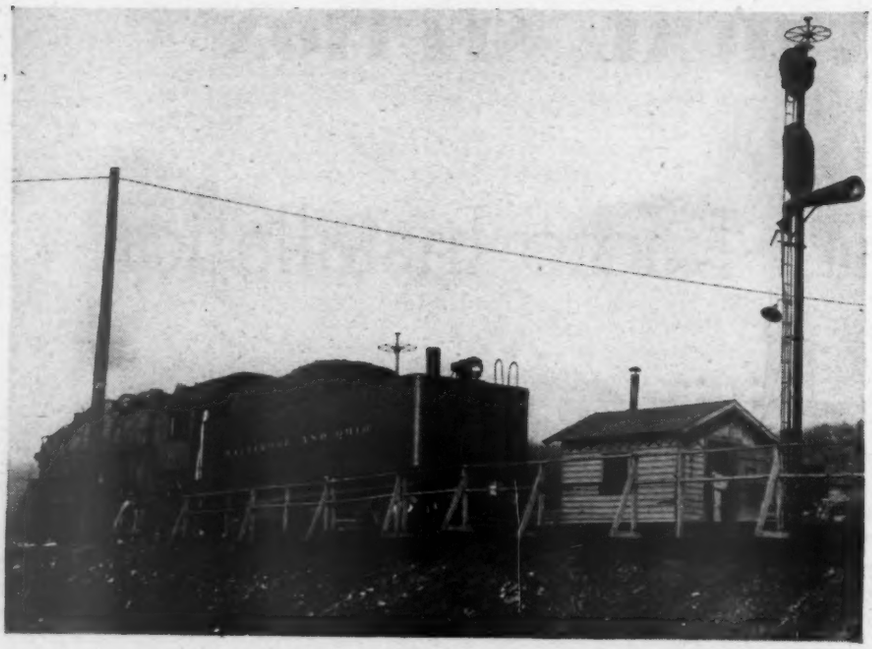
Fog Hides Hump and Hand Signals

Yard movements over the westbound hump were formerly governed by color-light hump signals and hand signals. Heavy fog, which prevails in the area about 200 days annually, hampered operations. At times it was practically impossible for enginemen to see close range hand signals, and color-light hump signals were practically obscured.

Consequently, the decision was made to try radio communication. A transmitting station was set up in the westbound hump shanty, and one steam locomotive was equipped with radio. When the experiments proved successful, two more steam locomotives were equipped, and the decision was made to make the installation permanent. The present transmitting station in the hump shanty, however, is expected to be moved in the near future to the yardmaster's office, nearby and shown on the accompanying diagram, with an antenna on the roof, and a remote control station established in the westbound hump shanty. This move will further facilitate both radio and yard operations.

With radio facilities in service, humping and classification service, as well as emergency instructions, are being given directly to enginemen without interference from fog, snow, rain, smoke and any other conditions which might obscure signals and hamper operations. Thus, better speed of operation is being obtained, in that verbal

The communication and power supply units on locomotives Nos. 634 and 713 are mounted on a steel plate between the sand and steam domes to decrease shock on the equipment



Westbound hump, showing locomotive No. 951 equipped with radio. Note antennas mounted on locomotive tender and at pinnacle of color-light hump signal. The westbound hump shanty is at the right

instructions can be made more specific than by hump and hand signals, and, at the same time, can be checked by repetition by the enginemen. In yard transfer operations, locomotives are dispatched while on the move without lost time for calling in by telephone. Additional pick-ups in the yards are arranged without delay, and, in the case of locomotive breakdowns, helper locomotives are requested at once and immediately dispatched to the area involved. In one instance a main line passenger train broke down about five miles from the hump shanty. When word was received of the breakdown one of the radio-equipped yard locomotives was immediately dispatched to the scene, to tow the train. Radio communication was maintained during the entire emergency, and facilitated the operation considerably, thus saving further delay of the passenger train.

Radio Equipment

The radio equipment in the westbound hump shanty is the Bendix Type RTG-1 and includes a Type MRT-1A communication unit, Type MS-104A control unit provided with a Type MT-107A microphone, Type MI-34A loud-speaker, Type MP-43A power supply unit and a Type MS-101A antenna. A typical mobile installation on a locomotive, known as the Type RTR-1, consists of a Type MRT-1A communication unit, Type MS-104A control unit provided with a Type MT-107A microphone, Type MI-34A loud-speaker, Type MP-44A power supply unit and a Type MS-101A antenna.

Each radio station in this installation is provided with call letters. The call letters of the westbound hump shanty are W10XXE. Each mobile locomotive station, likewise, is provided with call letters, namely, locomotive No. 634, W10XXH; locomotive No. 713, W10XXC; and locomotive No. 951, W10XXF. The operation of all radio facilities in the yards is governed by the operating rules of the Federal Communications Commission.

The communication units in the shanty and on the locomotives include low-temperature coefficient crystals for transmitter and receiver control. Temperature control is used to keep the crystal temperature within narrow limits, because the frequency stability of railway radio communication equipment must be of higher order than that designed for aviation use in the VHF (very high frequency) band. Rules require absolute tolerance of .005 per cent for a VHF railroad transmitter as compared with .02 per cent for an aviation transmitter. The channel width is 60 kc. in the 158 to 162 mc. railroad band, while 100 kc. has been proposed in the 108 to 132 mc. aviation band.

Since railroad radio communication involves transmission and reception over the ground with low antenna heights, the receiver must be capable of delivering a steady noise-free audio signal, even with rapid and widely fluctuating inputs having minimum values of one microvolt or even less. This unit produces an essentially constant loud-speaker input at all signal levels down to one microvolt. At one microvolt input, the signal to noise ratio is 20 decibels, compared to 25 decibels for an FM unit. Single conversion is employed, and response is down about 80 decibels at 120 kc. off resonance. The transmitter-receiver unit employs a peak noise limiter which sharply reduces response to impulse type noise. An electronic squelch mutes the audio system with no input, and operation is positive at ½ to 1 microvolt. With the squelch inoperative, plate current for the audio output stage is reduced to zero, thus effecting a considerable saving in standby power drain.

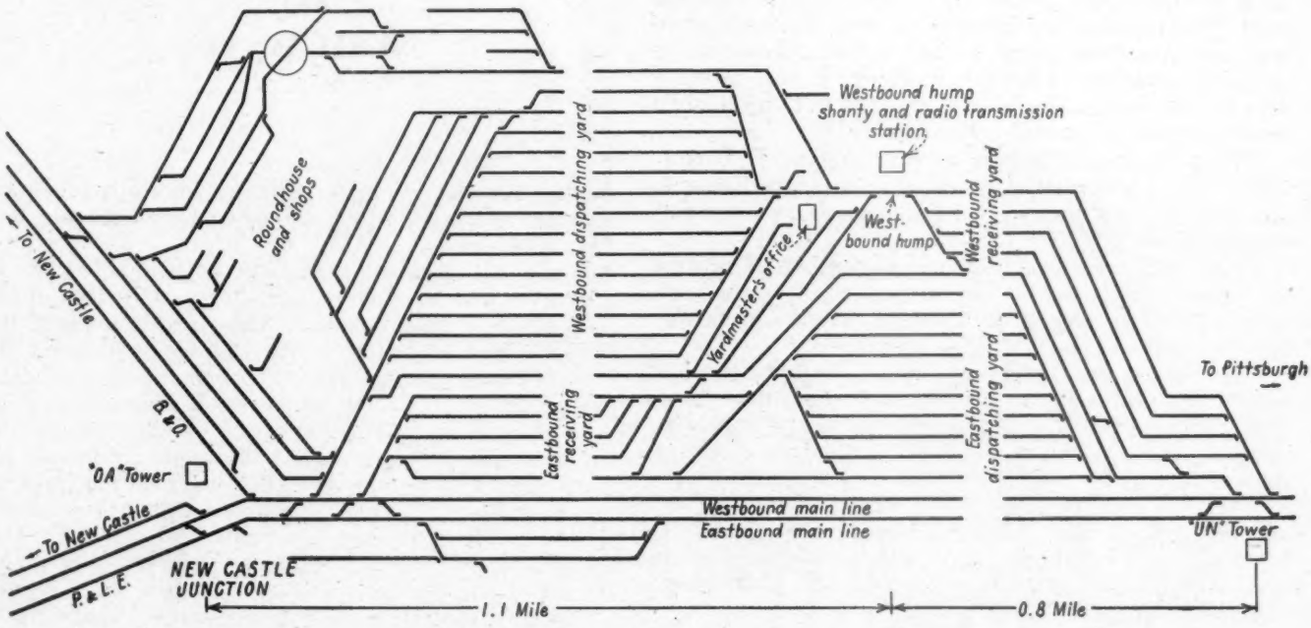
The transmitter power is 10 watts, and the crystal frequency multiplication is 36 to 1. The transmitter power output in the case of an AM unit such as this is slightly less than in a FM unit. A modulation limiter prevents overmodulation in this unit. A 50-ohm concentric line connects the antenna to the receiver or transmitter through a concentric line relay.

Power output in the unit in excess of 10 watts was considered unnecessary at the 159.27-mc. frequency. The receiver characteristics do much more in determining the performance of the system than transmitter power. In other words, this unit produces the same quality signal at one microvolt input as the earlier designed units, widely used in experiments heretofore, and accomplished with a 10-microvolt input. This represents a gain of 20 decibels. It would be costly and difficult to get the same gain by increasing the transmitter power output.

Although the transmitter-receiver unit is the AM (amplitude) modulation type, the construction is practically identical to that of the FM (frequency) modulation type. Thus, field conversion is easy if a change-over is necessary. The unit, designed for the 158 to 162 mc. range, is electrically interchangeable and identical, except for frequency range, to the 186 to 216-mc. frequency band unit.

Provisions have been made for dual frequency operation. Two sets of Type MX-13 crystals may be installed, and a switch on the control unit, which will be described later, would permit selection of either frequency. These two output frequencies could be up to 1.2 megacycles apart.

The transmitter and receiver are combined on a single chassis, thus conserving space and weight of the equipment, simplifying the maintenance and spare parts problem, and saving power input. The unit chassis is formed of 1/16-in. heavily cadmium-plated steel, and is mounted on rubber shock arms extending out from the sides of the base. Rubber bumpers on the bottom, sides and ends of the rigidly mounted base absorb extreme shocks. The equipment housing is water and air tight.



Schematic diagram of the yards at New Castle Junction, Pa.

Control Unit and Microphone

The control units in the hump station and on the locomotives incorporate an on-and-off switch, a red-jewel pilot lamp to indicate when the equipment is in operation, and a volume control for adjusting the loud-speaker output. The microphone is the dynamic type with differential, noise cancelling construction. Voice directed at the microphone from one direction only is clearly transmitted, whereas undirected noises such as escaping steam, whistles, engine and other noises are sharply attenuated. The microphone includes a push-button type switch which must be pressed before talking. The loud-speakers are the battleship type which are weatherproof, and measure 12 in. by 7 in. by 5 in.

The power supply unit, for radio in the hump shanty, operates on 110 volts, 60 cycles, a-c., from a commercial source. It consists of a full-wave vacuum tube rectifier and power transformer for supplying 325 volts, d-c., to the plate circuits in the communication unit. The 13 volts, d-c., power for filament and relay circuits in the communication unit is provided by a dry-plate copper-oxide rectifier and a transformer in the same power unit. Protection from overload or short circuits is provided by circuit breakers without the objectional characteristics of fuses.

The power supply unit on the locomotives is a regulated dynamotor unit, for operation on 32 volts, d-c., from the headlight steam turbo-generator. The first winding of the dynamotor supplies 13 volts, d-c., at 9 amp. for the tube filament and relay circuits in the communication unit. The second winding supplies 325 volts, d-c., at 1/4-amp. for the plate voltage. A carbon pile regulator maintains output voltages within plus or minus 5 per cent for input voltage variations up to 20 per cent.

The power drain in watts for the two types of power supply units under different operating conditions is as follows: When a communication unit is standing by, that is, with the receiver squelched, the power drain on the a-c. power unit is 200 watts, and 320 watts on the d-c. power unit. When receiving a signal, the drains on the respective units are 240 and 380 watts. When transmitting a signal, the drains are 280 and 425 watts, respectively. The current consumption of an MRT-1A unit, using an MP-44A power unit, is 10 amp. when transmitting, and 7.3 amp, when standing by. Using an MP-43A power unit, the current is 3.1 amp. when transmitting, and 2 amp. when standing by.

The antennas on the locomotives and at the hump shanty are identical, with the exception of their mounting. The antenna is pre-tuned and requires no field adjustment. It carries its ground plane with it, this being accomplished by a spoke device which looks like a wagon wheel. The pattern in the vertical plane is that of a 1/4-wave antenna, although the height is less than 1/4 wave and is achieved by the use of top loading. The use of a base insulator is avoided, and the center conductor of the coaxial cable drives the top disk only. Resonance and proper matching is secured through balancing the overall height, vertical element diameter and top loading disk diameter. A heavy pipe connection at the base of the antenna is used where extension of the antenna is required, such as on the tenders of the locomotives.

This type of antenna was adopted because vertical polarization offers considerable advantage over horizontal, in railroad radio service. First of all, a non-directional antenna pattern in the horizontal plane can be simply obtained with a vertical antenna, and second, the field pattern is not nearly so oscillatory with vertical as with horizontal. This latter phenomenon seems to be due to the more complete ground reflections that are realized

(*Continued on page 221*)

ELECTRICIANS SHOULDN'T SLEEP

By
Walt Wyre

"THE thing that peeves me most," Satch Simpson said, "is for some durn foreman to come breathing down my neck when I'm doing the best I can and everything is going haywire! Like this morning, I was setting a tire on the 5071. The blamed thing didn't lack more'n three quarters of an inch when it froze."

"Was Jim Evans hanging on your shoulder?" Barton, a pot-bellied boilermaker, asked. "It ain't like Evans to do that; he's got pretty good judgment for a foreman," Barton added.

"No," the lanky machinist, nicknamed 'Satch' because of his peculiar posterior, quickly replied. "I just mentioned that as a time when it would have made me sore if a foreman had come hanging around."

"The thing that makes me sore," Ned Sparks, the electrician, put in, "is have somebody yelling their heads off when I'm busy as the devil, then find there is no trouble at all, maybe a switch not turned on or something."

"Yeah, a polarity switch on a welder wrong, for example?" Barton said. "I've even been guilty of that."

"Yes, but I'm talking about sensible people that are supposed to know better," Sparks grinned. "Boilermakers are not supposed to be bright."

"Aw, go to hell!" Barton corked his thermos bottle and placed it in his lunch box. "'Bout time for the work whistle," he said.

The place was in the electric shop at the S. P. & W. roundhouse in Plainville. A half dozen men had come in where it was warm to eat their lunch. The whistle blew and ended the conversation, the subject at the moment being pet peeves. When the whistle blew, all of the men except Sparks left the electric shop and went to their various jobs. Sparks was overhauling turbo generators for locomotives in the electric shop.

It was a good day for an indoor job. Outside the wind was blowing gusty drafts from the northwest that whipped and whirled a mist of rain that threatened to change to snow or sleet at any moment. Already thin crusts of ice were beginning to form and small icicles fringed roof eaves and wires.

Sparks was reaming a turbine governor valve seat when Jim Evans, the roundhouse foreman, came in. "The dispatcher just phoned that the water pump motor at Sand Springs won't run," Evans said. "He wants you to get out there soon as possible and get it going."

"How am I going to get there?" Sparks asked. "They only run one train a day and it leaves around eight o'clock in the morning."

"Guess you'll have to take the truck," Evans told him. "Ordinarily a water station out of commission wouldn't make much difference on the branch line, but there's an extra gang working close to Sand Springs and a work train that ties up there."

"Okay," Sparks said resignedly and started gathering up tools that he had been using on the turbo generator.

IT DIDN'T take long for Sparks to be ready to go. He checked the gas and oil in the truck motor, phoned his wife and told her not to look for him back until late, and was on his way.

It is about forty miles by rail from Plainville to Sand Springs and at least ten more by highway, if part of the road could be called a road. About fifteen miles of the road is not paved and very little else has been done to it. Usually about election time, the commissioner sends a maintainer out to smooth up the worst places.

It was still raining a sort of dreary drizzle when Sparks left Plainville. He made good time until he turned off the paved highway and on to the dirt road that goes to Sand Springs. The mud wasn't so deep but was awfully slippery. The truck had practically no load, just a few odds and ends of wiring materials, Sparks' tool box, and line tools that stay on the truck. A little more weight would have made the truck handle better. Sparks was making about twenty miles an hour on the road, ten back and forth sideways and ten ahead, until he met a car on a hill. The road was slightly narrow, but wide enough when dry. When Sparks turned out to meet the car, the rear end of the truck slithered to the right. Sparks stepped on the gas and it slid further until the right rear wheel was in the ditch. When Sparks tried to back the truck out of the ditch, it slid over further, and when he tried to pull ahead, the wheels just spun with very little effort to move the truck at all.

Sparks swore, turned off the ignition, and climbed up in the back of the truck to get some chains—and there weren't any chains. He looked in the tool box, under the seat, and every place. Evidently someone had removed the chains and failed to replace them.

Sparks swore some more, then started the motor and tried to drive the truck out. No soap; all he succeeded in doing was sinking the rear wheels deeper in the mud. He again killed the engine and began looking for something to use for chains. Usually there were one or two small chains in the truck, but this time there weren't. The only thing he could find was some pieces of rolls of wire, mostly number eight weatherproof, and several short lengths of BX cable. Sparks was tossing the pieces of BX back in a box when he had an idea. He took several of the shorter pieces of cable and wrapped them around the wheel and tire and twisted the ends of the number twelve wires securely together. There were five openings in the wheel and he threaded two turns of the BX cable through each opening of both rear wheels.

He then climbed in the cab, started the engine, and with the gears in low, let the clutch out easy. The truck pulled right out and Sparks was again on his way, but not slipping and sliding so much as before.

The makeshift chains served the purpose but didn't last very well. When Sparks stopped the truck at the pumphouse at Sand Srings, only three of the ten pieces of BX were still on the wheels and those three were just about ready to give up.

Sparks unlocked the pumphouse and went in. Before he had time to see what the trouble was, the section foreman who lived nearby and looked after the pump came in.

"Found the trouble?" the section foreman asked.

"No," Sparks told him. "I just got here. When did the motor quit?"

water that the pump should have started, but it didn't. I came over to fetch a bucket of water, we get our water here at the pumphouse, and noticed it wouldn't start, but didn't do much then, it was too danged cold. Some of them extra gang fellows had left the pumphouse door open and it was cold as blazes. The hydrant was froze and I couldn't get any water."

"Was that when you called the dispatcher?" Sparks asked.

"No; after breakfast I came back and tested the fuses. When I saw that the fuses were okay and still the motor

"Oh, the wire is insulated," the section foreman explained

"Last night sometime," the section foreman said. "There was plenty of water late yesterday afternoon, then this morning about six o'clock the work train engine filled up and filled the extra tank. That used enough

wouldn't run, I called the dispatcher."

"What do you use to test the fuses?"

"A piece of wire." The section foreman reached up and lifted a piece of number six rubber covered wire with

two short sections at each end bare. "I just hold one end of the wire on the bottom of a fuse and sorta scratch the other end of the wire across the bottom of another fuse. If it sparks, I know the fuse is okay. A fellow at a garage showed me how to test a battery that way," the section foreman explained.

"Well, anyway, if you don't get killed you can tell if you had juice when you tested, if not afterwards," Sparks remarked.

"Oh, the wire is insulated," the section foreman explained, "and there was lots of juice, got a big spark about two inches long."

"If I were you, I would either get some other means of testing fuses or not test them at all," Sparks suggested. "Besides being hard on fuses, there's always a chance of getting hurt."

Sparks tested and found one of the fuses still good. He replaced the defective ones, then closed the switch. Nothing happened. He examined the automatic starter which appeared to be okay. When he shorted the terminals of the line to the pressure switch, the controller operated and the motor started, but stopped when the piece of wire Sparks was using was removed.

"What was the trouble with it?" the section foreman asked.

"Looks like there's either an open between the controller and pressure switch or else the pressure switch is not working," Sparks said, "and my guess is the pressure switch is not working."

Sparks walked over to the pressure switch and removed the cover. As he had expected, the pressure switch was open.

"Has any one been fooling with the adjustment?" Sparks asked.

"Not that I know of," the section foreman replied, "unless one of the water service men monkeyed with it. Two of them were here day before yesterday, I believe it was.

Sparks turned the adjusting screw slightly. The switch closed and the motor started. "Guess one of the water service men must have changed it," Sparks said. "How long will it take to pump the tank full of water?"

"Well," the section foreman scratched his head thoughtfully, "it pumps about a foot of water in about forty-five minutes and usually shuts off when the water gets about a foot and a half from the top of the tank. The pump usually runs about three hours, but the tank is emptier than usual."

While the section foreman was talking, Sparks did a bit of mental arithmetic and decided the motor would have to run seven or eight hours to fill the tank. He tapped the pressure switch lightly and there was no indication of it shutting the motor off soon. "Guess I'd better get started back to Plainville," Sparks said, "unless I want to spend the night here in the pumphouse. If the motor doesn't stop when the tank gets full, pull the switch. I'll come back when the tank is nearer full and adjust the pressure switch."

THE unpaved section of road was more slippery going but Sparks drove carefully and managed to reach the paved highway without getting stuck. It was considerably colder and the rain had turned to snow. By the time Sparks reached home, a little after midnight, the mercury was playing around zero and still dropping. He thought of driving the truck home and leaving it there until morning, which he had done a few times before despite the rule against it, but decided it would be wiser to take it to the roundhouse.

After putting the truck in the garage, Sparks took a deep breath and headed through the snow for home. The distance was only a little over eight blocks, but it seemed much further and when Sparks reached home he was fairly dragging.

"Did you go by the shop?" his wife asked when Sparks entered the door.

"Yes, but I didn't see anybody," Sparks told her. "Why?"

"They've been calling about every fifteen minutes since nine o'clock," Mrs. Sparks said.

"Who's been calling? The roundhouse clerk?"

"No, some one at the passenger station. Whoever it was said for you to call the ticket office soon as you came in."

"Well, fix some coffee and a bite to eat," Sparks told his wife, "and I'll see what's bothering them. I have an idea it's a lamp bulb burned out or something else about like that."

After three efforts when the line was busy, Sparks received an answer from the ticket clerk. "We are freezing to death," the ticket clerk told Sparks. "The stoker motor or something has burned out and we can't get any heat. The waiting room is full of people all shaking and shivering and wanting to know when they can start looking for St. Bernard dogs with brandy."

"Why don't you call the roundhouse office and tell the clerk to have the night electrician see what the trouble is?" Sparks asked.

"We called the roundhouse. The night electrician came down and looked at the motor. He took it off and hauled it to the roundhouse. A little later he called and said the motor was burned out and there wasn't another to put on," the ticket clerk explained. "You'll have to do something. This place would give an Eskimo pneumonia," the clerk added.

"Well, I don't know what I can do," Sparks replied, "but I'll go to the roundhouse and see what can be done."

AFTER two cups of coffee, a sandwich, and a piece of pie, Sparks felt like facing the snow again, but more like hitting the hay. When he reached the roundhouse office, the division engineer was there evidently waiting for him.

"Haven't you got a spare motor you could use on the heating plant?" the division engineer asked. "We've got to get some heat somehow. It's almost cold enough to freeze the water pipes right now."

"Let's take a look at the motor," Sparks suggested.

One look or one sniff was sufficient to tell that the motor could not be repaired in a matter of minutes. "It's burned up," Sparks announced.

"That's what I told them," the night electrician cut in, "and if there's another three-horse motor around that we could use, I don't know where to find it," he added.

"Is this off the stoker?" Sparks asked.

"No, it's off the blower fan," the other electrician replied. "It's a hot air system and you can't get any heat without the blower fan running. The only place that gets warm is the basement and there's just about room in there for the office cat."

"Isn't there some machine that's not used much you could take a motor off of?" the division engineer asked.

"You'd have to see the foreman about that," Sparks told the division engineer. "I wouldn't assume the responsibility."

"I'll see the foreman," the division engineer said. "Where'll I find him?"

"Maybe in the office, in the roundhouse, or down at the storeroom," the night electrician suggested. "I'll see if I can find him for you."

Bob Parker, the night foreman, was located in the far end of the roundhouse. He accompanied the night electrician to the electric shop. "Well, let's go out to the machine shop and look around," Parker suggested, "but I don't know of any machine that's not likely to be needed at any time," he added.

After canvassing the machine shop, the night foreman decided that the motor might be taken off the punch and shear machine, provided it was replaced right away.

"But it's only two-horse power," Sparks demurred. "What we need is a three-horse motor. The only one I know anything about is the one on the drill press in the tool room."

"We couldn't spare that one," Parker said. "If you can't use the one off the punch and shear, you'll have to find one somewhere else."

"Well, that should do," the division engineer said. "All it has to do is run a blower fan. That shouldn't take much power. What do you think, Sparks?"

"Well, I'm afraid it wouldn't do long if it ran the fan at the same speed as the three-horse motor did, but we might put on a smaller pulley and use the two-horse motor."

"Okay," the division engineer cut in, with a trace of irritation in his voice. "Let's get a smaller pulley, if that's what is needed. Anything to get the passenger station warmed a little!"

"If you'll take the motor off the punch and shear, I'll see if a suitable pulley can be found," Sparks told the night electrician.

SPARKS measured the pulley on the burned motor and found it to be six inches and had four grooves for Vee belts. A quick search in the electric shop and storeroom failed to locate a pulley that could be used. He again examined the pulley on the burned motor. "Say, this pulley could be cut down a little and used. It shouldn't take very long to set it up in a lathe and turn it down enough."

"There's not enough stock," the night foreman objected. "Why, you couldn't take more than half an inch off that pulley."

"Wouldn't need to take more than half an inch off," Sparks said. "I'll bet three-eighths off would be enough. That would reduce the diameter three-quarters of an inch." Sparks pulled a pencil out of his pocket and began figuring. "Yep!" he said, "take three-eighths off. That'll reduce the power required sufficient for the motor to not be badly overloaded, or if you want to be more exact, take off seven-sixteenths."

"Maybe you know what you are talking about," the division engineer said, "but it looks to me like you would need to take an inch off the pulley. Two-thirds of six if four, according to my figures. But if you think three-eighths of an inch enough, I won't argue. Let's get it going."

"Okay," Parker said, "I'll get a machinist on the job right away."

"Let's see about the bore," Sparks suggested, "and we can take the motor down and be putting it on while the machinist is turning the pulley. Chances are we will have to figure out some way to mount the motor on the base. That'll take a little time," he added.

Just as expected, the two-horse motor wouldn't fit on the base. Sparks found some boards that could be used to make a temporary sub-base. He bolted the motor to the boards, then bolted the motor to the base.

The division engineer had waited at the machine shop for the pulley and by the time the motor was set and connected he came with the pulley. "The machinist had to make a bushing for the pulley or I would have been here sooner."

"Soon enough," Sparks said. "We are just now ready for it."

The bushing was slightly small, but a little driving persuaded the pulley to go on the shaft. Then it was only a matter of a very few minutes to put on the Vee belts and close the switch.

THE motor started nicely and came up to speed. By the time the three men, the division engineer, the night electrician, and Sparks had walked up to the waiting room, warm air was coming from the registers.

"Hooray!" several service men yelled, as they crowded around. "Here, lemme give you a citation!" One of the service men took a ribbon from his blouse and attempted to pin it on Sparks.

Sparks laughed and refused the ribbon. "All I want is a little sleep," he told the soldier.

It was almost four a. m. when Sparks reached home, and bed.

"What time do you want to get up?" his wife asked.

"'Bout noon," Sparks yawned, and fell in bed.

Sparks didn't sleep until noon as he had hoped. About nine-thirty the phone rang. It was the roundhouse clerk calling. "Tell Sparks he has to go to Sand Springs right away," the clerk told Mrs. Sparks.

"What's the matter?" Sparks roused up and asked sleepily.

"They want you to go to Sand Springs right away," his wife said.

"I went to Sand Springs yesterday," Sparks mumbled and pulled the covers over his head.

His wife hung up the receiver and went into the bedroom. She shook Sparks awake. "They want you to go to Sand Springs again."

"All right!" Sparks grumbled. "I'll go, but I won't like it. Have you got some coffee?"

Sparks reached the roundhouse office about ten-thirty very much out of humor. "What's the trouble at Sand Springs now?" he asked the clerk.

"Oh, the pump motor wouldn't shut off and the tank ran over. The dispatcher is raising Cain because there's ice everywhere."

"I told the section foreman to pull the switch if the motor wouldn't stop when the tank got full," Sparks said.

When Sparks arrived at Sand Springs he saw that the condition had not been exaggerated. On one side of the tank was a solid sheet of ice.

"Why didn't you pull the switch when the tank got full?" Sparks asked the section foreman.

"It ran over in the night," the section foreman said.

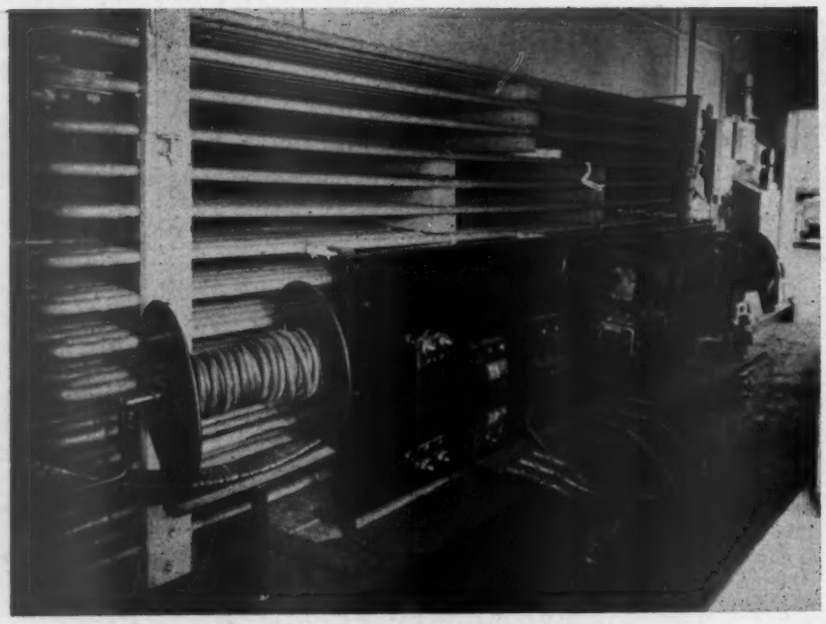
Sparks examined the pressure switch and saw that it was still closed and with no indication of opening even though the tank was full. He loosened a pipe union below the pressure switch and no water came out. "Guess the pipe must be stopped," he said.

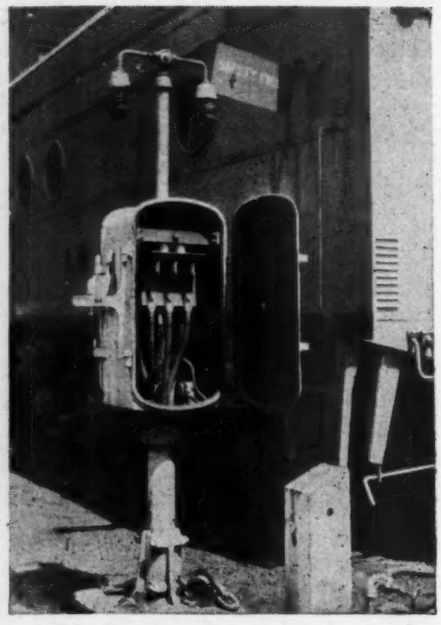
The pipe was stopped—with ice. Water in the pipe had frozen solidly, evidently from the door having been left open. That explained why the pressure switch had failed to operate to start the motor when the tank became empty or to stop it when the tank was full.

"Next thing you know I'll be testing fuses by shorting them with a piece of wire," Sparks mumbled.

"What's that?" the section foreman asked.

"Oh, nothing. I was just remarking about how dumb I was to not notice the pipe being frozen yesterday. Even after you mentioned the hydrant being frozen, I didn't think of it. I may be back for a job on the section any time," he added.





Left: The rheostat which is mounted on a truck is normally used in a building and connected by the cables shown in the foreground through an underground conduit, to the junction box. Right: The junction box is conveniently located alongside the test track

Rheostat for Load Testing Diesel Power Plants

A rheostat for load-testing Diesel engines and generators, which is light in weight, is portable and insures a steady full load for an indefinite time, is used by the Union Pacific at Omaha, Neb., for load testing the power plants and control equipment on its Diesel-electric locomotives. Normally the rheostat is housed in a small building from which permanent cables are run to a junction box close to the track where the locomotives are placed when the power plants are to be tested. The rheostat can also be moved on its own truck for testing at any other location where water is available for cooling.

The resistance used consists of about 600 ft. of 1½-in. stainless-steel tubing. It is made of 10-ft. lengths of tubing made in a continuous coil by means of welded U-turns. Water is run through the tubing continuously.

Only one pair of leads is used to carry the load current from the locomotive and tests are made at full load only. Electrical taps or connections at different places on the tubing allow for loading of engines having various ratings. The load circuit is controlled by remote-control contactors operated from the 230-volt d.c. shop circuit. Two contactors are used in each lead to provide necessary capacity.

For measuring the generator load there is an ammeter and a voltmeter on a small panel board. There is also an ammeter on the panel for measuring exciter current. This is connected to the exciter by leads carried on a portable reel.

The rheostat takes the place of the traction motor load. It serves to determine if both engine and generator are delivering rated load and permits of testing control equipment under full load conditions.

Protection for Buried Conduit

Thin, porous mats of bonded glass fibers, originally developed for use as retainer mats in storage batteries and widely employed for this purpose, have been successfully applied to the protection of underground pipe and conduit, according to a report published in the January 1946 Journal of the Franklin Institute.

In roll form, the Fiberglas mat is being employed as a material for wrapping underground oil, gas and other pipe lines to protect them against corrosion and electrolytic action. The material can be wrapped around bitumen or coal tar-coated pipe, thus forming a continuous watertight bond.

The glass fibers are non-corrosive to metals. The material has negligible moisture pick-up. Its tensile strength is preserved through a wide range of temperatures and exposure to organic solvents and soil acids. The millions of fine intertwined glass fibers reinforce a large amount of bitumen or coal tar coating for a given thickness of wrapping, as compared to other carriers.

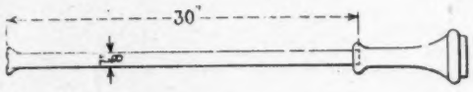
Recent tests made by the Committee on Electrolysis, Engineering Division, Association of American Railroads, have shown that a coating of asphalt applied to the outside of a concrete cylinder encasing a central steel rod is highly effective in the prevention of corrosion due to electrolysis. The data collected by the Committee indicates that the use of a glass-wrapped, bitumen-coated pipe might effectively withstand electrolytic corrosion for long periods of time.

One of the concrete-covered rods used for corrosion tests made by Electrical Section, Engineering Division, A.A.R.—see *Railway Mechanical Engineer*, January, 1946, page 32

Bearing Fault Detector

The device shown in the illustration is used for detecting noisy or defective ball bearings in small motors used on air-conditioning fans and pumps or any other motors equipped with ball bearings. Often, the noise will develop in motor bearings, and it is difficult to determine which bearing is causing the trouble. By using this device it is easy to locate the particular bearing causing the trouble, and in most cases, when it is on the commutator end, the bearing can be replaced without removing the motor.

The device consists of a hardwood stick, ⅞ in. in diameter and 30 in. long, to the end of which is rigidly



A telephone receiver on a stick makes a much better listening device than a stick alone

fastened an old style telephone receiver. A stick alone is frequently used for this purpose, one end being placed against the housing of the suspected bearing, the thumb knuckle of the hand holding the stick placed in the listener's ear. This method works fairly well, but the telephone constitutes an improvement. With the older method, the flesh of the thumb and ear caused a considerable damping effect. With the telephone receiver, although there is no electrical connection, the diaphragm is set in motion by the vibration, and effectively transmits this vibration along the air column between the receiver and the ear drum.

Permanent Radio Installation

(*Continued from page 215*)

with horizontal polarization, which results in more complete addition or cancellation with the direct wave, emphasizing peaks and troughs and making it more difficult to cope with flutter conditions encountered when range approaches the maximum.

The radio communication facilities at New Castle Junction were installed under the direction of A. S. Hunt, chief engineer, communications and signals, and under the supervision of L. J. O'Connell, assistant communications engineer. The installation of all radio equipment on the three locomotives was done under the supervision of Harry Rees, superintendent of motive power, Central region. The major items of radio communication equipment were furnished by the Bendix Radio Division of the Bendix Aviation Corporation.

CONSULTING DEPARTMENT

Is the Building Up of Controller Segments Practicable?

Low First Cost Does Not Warrant Rebuilding

We do not consider the building up of controller segments and fingers to be a good welding application. The average cost of either a segment or finger is in the neighborhood of 25 cents. If they are built up by welding or brazing, the labor entailed in finishing them to the proper contour after welding would cost four or five times as much as a new segment or finger.

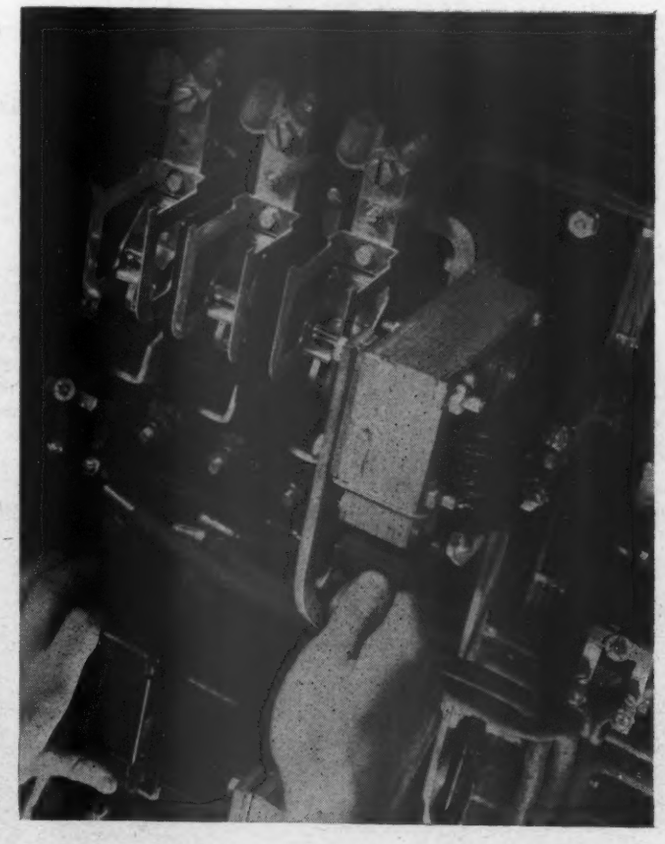
E. VomSteeg, Jr.,
Welding specialist,
General Electric Company

Built-Up Segments Can Be As Good As New

The opinion of a number of maintainers is that built-up segments and fingers with removable tips are just as good as the original item—if the work is done by an expert, and turned down to correct size.

There is considerable advantage in building up large drum segments, which are difficult to replace, but building up small finger tips may exceed the cost of new ones.

There are other factors which must be taken into consideration, such as the composition of the segments, and how far gone they are before brazing is resorted to. Our experience has been with segments only slightly pitted, or worn at the tips, and the highest voltage we have so far



dealt with is 700 at a current of 5 to 40 amp. The result may be different with higher voltage or current values.

A. H. Matthews,
Lake Beauport, P. Q.
Canada

NEW DEVICES

Small Motor Develops Two Hp.

A compact and light 2-hp. explosion-proof, continuous-duty motor has been developed by Electrical Engineering and Manufacturing Corp., 4606 W. Jefferson blvd., Los Angeles, Calif.

The motor is designed for railroad, marine, aircraft, and special industrial applications. The armature speed is 9,000 r.p.m., and an integrally built gear reducer, supplied where lower speeds are required, adds only 2 lb. to the basic weight of 15 lb.

The enclosure renders the motor safe for use in hazardous locations and it is suited to such applications as fan, blower, pump, winch, and other drives, where high, continuous-duty horsepower must often be fitted into extremely small space.

The armature is mounted on ball bearings and the motor is insulated with glass

The motor runs at 9,000 r.p.m., develops 2 hp., and weighs 15 lb.

insulation and high-temperature varnishes. It can be operated in continuous duty with a temperature rise of 75 deg. C. over an ambient temperature of 25 deg. C. and can be supplied for operation on 28, 32, or 110 volts d.c.

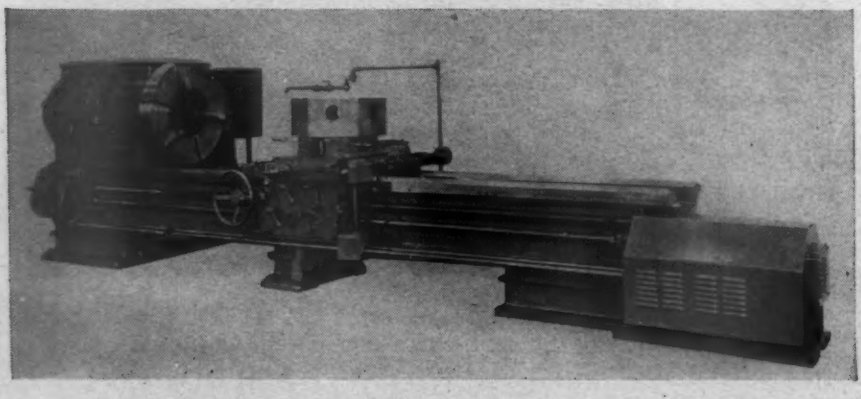
Automatic Feed Regulator

The illustration shows a 36-in. swing Lehmann Hydratrol lathe with a 16½-in. spindle hole. This machine is equipped with a 24-in. hexagon turret fitted with a turret feed regulator having automatically positioned longitudinal and cross feet stops.

The indexing of the turret accomplishes four things; first, it brings a new turret face into the work area; second, it indexes a set of front and also rear cross slide positioning stops; third, it indexes a set of longitudinal stops that may be used either for positioning a cross feed cut or as a precision longitudinal feed stop operating a magnetic brake on the feed rod drive through the action of Micro limit switches, and fourth, it automatically regulates the rate of feed by means of a six-position rotary cam.

The feed regulating cams for each turret face are independently adjusted by means of adjusting screws and the calibrated chart. The automatically regulated feed rod drive does not interfere with the operation of the standard lathe quick-change feed gear box either for feeds or threading. A lever is used to disengage the automatic drive, and is electrically interlocked to prevent the simultaneous application of power through both drives. Threads may be cut with the turret, using the leadscrew without disengaging the automatic drive. This is accomplished by use of a half nut engaging a handle on the apron.

Hydratrol lathes are made by the Lehmann Machine Company, 3560 Chouteau avenue, St. Louis, Mo.



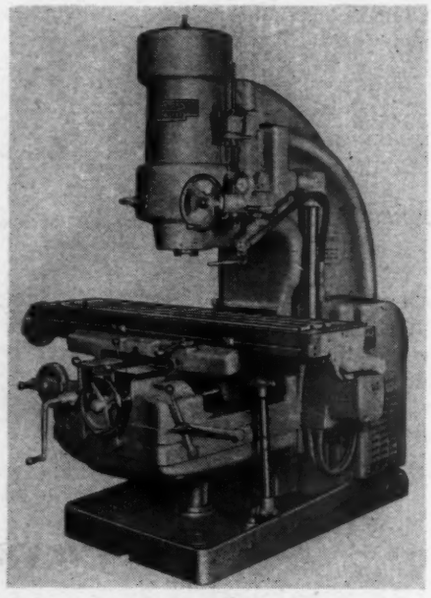
Automatic feed regulator for hexagon on Lehmann 36-in. Hydratrol lathe

Milling Machine

Kearney & Trecker Corporation, Milwaukee, Wis. announces the CSM line of knee-type milling machines. Horizontal and vertical models are available in 20-hp. and 50-hp. sizes.

The development of these machines is the result of research work in the application of carbides to a variety of milling problems. Experimentation in the use of carbide cutting tools on standard models of milling machines indicated the basic requirements of machines designed for maximum efficiency when milling steel with carbides. The CSM machines were designed to meet requirements for increased rigidity, greater horsepower, and a more uniform flow of power to the spindle.

The solid-back column of the CSM milling machine has the spindle-drive motor cross-mounted in the base. Power is transmitted to the spindle through multiple V-belts and the spindle speed selection box. Sixteen speeds from 50 to 1,250 r.p.m. and



Kearney & Trecker CSM knee-type milling machine

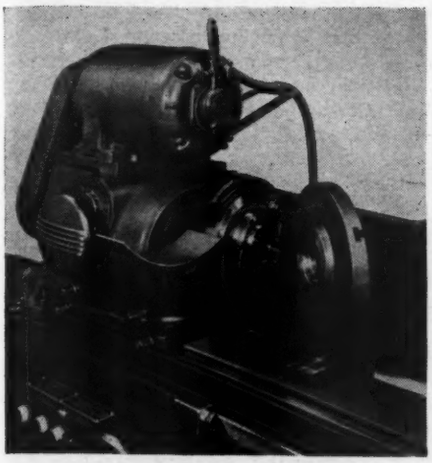
32 feeds from ⅜ in. to 90 in. per min. are in approximate geometrical progression. The spindle is provided with a center-bearing spindle to reduce deflection and a heavy flywheel is splined to the spindle to produce a uniform flow of power to the cutter.

A feed and rapid-traverse motor mounted on the right side of the knee furnishes power to the table feed mechanism. Climb cutting equipment is supplied for the table.

Headstock for Grinding Machines

A redesigned headstock has recently been applied to the line of hydraulic universal grinding machines built by Cincinnati Grinders Incorporated, Cincinnati 9, Ohio. One feature is the adoption of a modified lathe standard spindle nose, which permits standard chucks and face plates to be mounted without intermediate adapters. Dimensions conform substantially to American standard except that the number of threaded holes for mounting chucks and face plates has been reduced to four, and the taper is slightly smaller to assure a positive squaring-up action of the chuck or face plate against the spindle flange.

The majority of live spindle work will be accomplished with a chuck or face plate mounted directly on the spindle nose. However, it may be desirable to remove the work and chuck as a unit for inspection. An operation of this type may be accomplished with the quick-change adapter ap-



Spindle nose and face plate of headstock for Cincinnati grinding machines

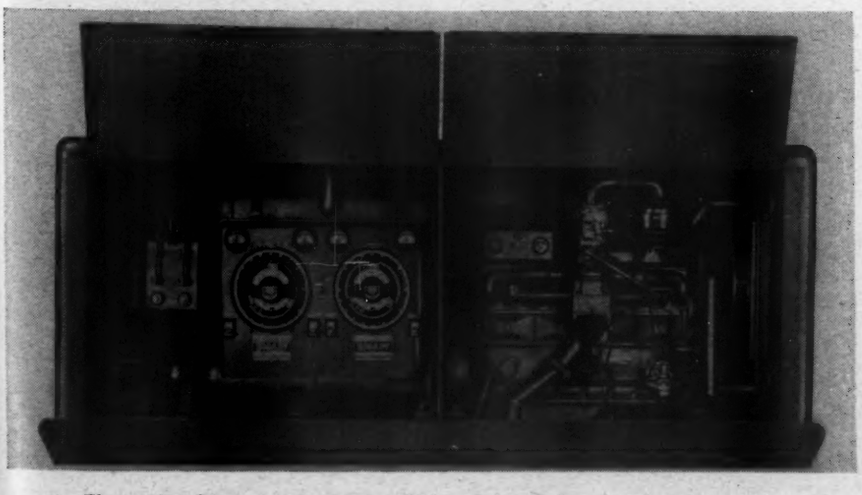
plied to the chuck. The unit has the same dimensions as the spindle nose and has L-head bolts for clamping it thereto.

Another improvement is in the mounting of the spindle. It now runs on two adjustable anti-friction bearings, one at the front and one at the rear end, with a single accessible adjustment at the rear. In addition to the obvious advantage in convenience of adjustment for wear, a more rigid construction is obtained with very little overhang from the front bearing to the spindle nose.

Two-Operator, Gas-Drive Welder

The Hobart Brothers Company, Troy, Ohio, has developed a two-operator gasoline engine-driven arc welder by placing two 300-amp. generators on a common shaft, supplied with separate excitation from a common exciter. The double unit is directly connected to an eight-cylinder Chrysler industrial engine. Two operators can work independently of each other, since the engine is governed to maintain constant speed for all loads. A paralleling switch turns the unit into a single-operator 600-amp. unit.

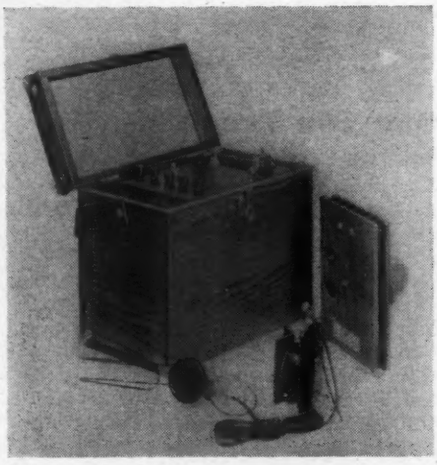
Because welding is inherently an intermittent load, two units can be connected to one engine to give a higher overall economy. The net idle running time of the engine is reduced, and engine-service time and maintenance are reduced.



The engine drives two generators which may be used separately or in parallel

Cable and Pipe Locator

An instrument for determining the precise location and depth of buried pipe and cable, called the Stewart Cable Tester Locator Combined, is announced by W. C. Dillon & Co., Inc., 5410 W. Harrison street, Chicago 44. It can be used to tell just where cable or pipe is buried, and just how deep, or to find old cable or pipe laid many years ago on which installation records have been lost or forgotten. It will also locate the path of cable or pipe



The Stewart Cable Tester and Locator Combined

to or from buildings, or find the position of a water main. It is especially valuable for checking the depth of cable at river crossings and may be used to determine whether or not a service pipe is below the frost line in lowering or regrading a thoroughfare.

It is furnished with detector coil and neutral exploring coil. A built-in level in the exploring coil enables the operator to maintain accuracy.

The unit is ruggedly built, easily portable and compactly encased for rough use and weather. It weighs approximately 22 lb., including head phones, neutral exploring coil, and fish-scale exploring coil.

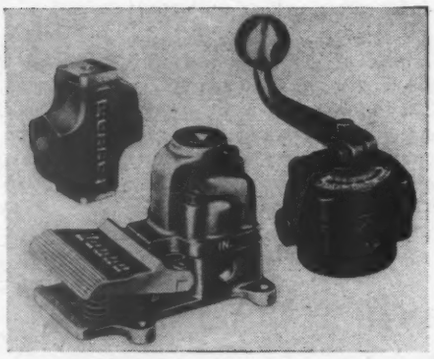
Control Valves

Three valves for air and hydraulic controls have been designed by the Hanna Engineering Works, 1765 Elston avenue, Chicago 22.

One type is a packless ¼-in. valve, called Unitite Jr., for tubing and light piping applications. It is designed for four-way operation but may be used as a three-way valve by plugging one port. This valve is suitable for air, oil, or water at pressures up to 250 lb. per sq. in. and is available for manifold, column, or panel mounting. An 80-deg. movement of the handle reverses the air or liquid flow.

The foot-operated valve is a packless control for use in air and oil hydraulic-cylinder applications. Freeing hands for other work, it is made in two styles—one with a single pedal for constant cycles of operation, and the other with a split pedal that holds its position until tripped for reversal. It is available in ⅜-in., ½-in., ¾-in. and 1-in. sizes operating at either an air pressure of 250 lb. per sq. in. or an oil pressure of 1,000 lb. per sq. in.

The control of cylinder piston speed in both directions is accomplished by the two-direction speed-control valve. Installed between the operating valve and one end of the cylinder, it permits the adjustable control of the inflow and outflow of the air or oil independently to and from one



Left: The Hanna two-direction speed control valve—Center: The foot-operate valve.—Right: The ¼-in. Unitite Jr. with handle control

side of the piston. One valve is required for oil operation, two are recommended for air. Working pressures are 250 lb. per sq. in. for air cylinders and 1,000 lb. per sq. in. for hydraulic. Pipe sizes available are ¼ in., ⅜ in., ½ in., ¾ in., and 1 in.

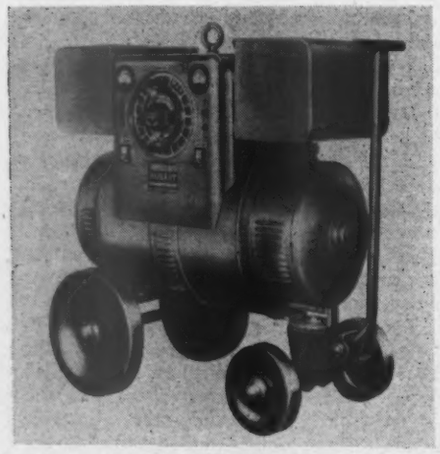
Battery-Charger Welder

A battery-charger arc-welder combination for charging railway coach batteries and electric arc welding has been developed by the Hobart Brothers Company, Motor Generator Corporation Division, Troy, Ohio. This dual purpose machine was designed especially for the railroads. It has complete, separate control panels with instruments—one for each battery circuit and one for the welding circuit. A switch provides for changing from charging to welding, or from welding to charging.

The set is made in two sizes. The model No. 496 is a Hobart 300-amp. electric

motor-driven welder including a MGC panel circuit for charging one railway coach battery at a maximum rate of 200 amp. at 50 volts, d.c. The model No. 497 is a Hobart 400-amp. electric motor-driven welder including MGC panel circuits for charging two railway coach batteries at one time and at a maximum rate per battery of 150 amp. at 50 volts, d.c.

Each MGC charging circuit includes the following: one voltmeter for measuring



A switch and separate control panels provide for either welding or battery charging

voltage of generator and/or battery; one ammeter to indicate charging current; one 200-amp. knife switch to open charging circuit; one 175-amp. Fusetron in charging circuit; one automatic reverse current cut-out (to prevent flow of current from battery to generator).

Drill Chip Breaker

A drill chip breaker, which breaks the chip at each revolution of the drill, has been introduced by the Ex-Cell-O Corporation, Detroit, Mich. The unit, tested for nearly a year by the manufacturer, breaks chips into small pieces that are carried up the flutes of the drill.

In operation, the short chips accumulate around the mouth of the hole, eliminating the long whirling spirals which would otherwise be thrown around the machine and on the floor by the revolving drill. If the work requires coolant, it flows on the work and down the drill flutes, past the short loose chips to the point of the drill without splashing.

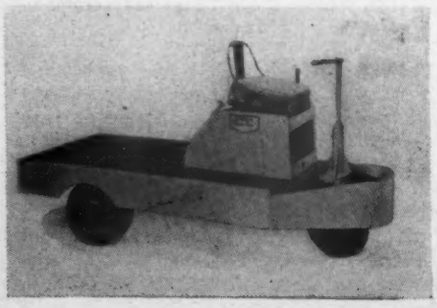
The chip breaker can be used vertically, horizontally, or at any angle at which housing can be kept stationary while the drill rotates. An arm is provided to prevent rotation of the housing. Where space permits, the chip breaker can be used in multiple spindle heads.

Ex-Cell-O drill chip breaker

One-Ton Truck

The Model HB Chore Boy, announced by The Buda Company, Harvey, Ill., is a dual-wheel, platform-type truck of one-ton capacity. This truck is the same as the Model FF except that it has a shorter wheel base, thus permitting carrying the same loads with easier turning in narrow aisles. In addition, it has better traction.

Model HB weighs 1,000 lb. is equipped with a 7.7-hp. air-cooled four-cycle engine and is capable of speeds up to 15 m.p.h. Its construction features consist of an electrically welded reinforced steel frame



Buda Model HB Chore Boy

and a loading space of 12.8 sq. ft. It has a length of 92 in., a width of 32 in. and a 56-in. wheelbase with a 15-ft. turning radius.

Pneumatic Unit For Kick Presses

The National Pneumatic Company, 420 Lexington avenue, New York, has designed a pneumatic unit that, when installed on any kick press, converts the press to power operation. The unit is comprised of an air engine of 270-lb. rated power delivered at 100 lb. air pressure. This engine is mounted on a pivot-type bracket and attached to the kick press lever; a foot-operated control valve is piped to two flexible hose connectors; a speed adjusting fitting is provided to control the speed of the engine stroke in both directions. There is a cut-off cock for shutting off air to the unit, and an air strainer is placed in the air supply line leading to the control valve.

If desired, two hand-operated control valves may be substituted for the foot control valve as an additional safety factor.

National Pneumatic air engine installed on kick press

With the hand-operated valves, the press operator must employ both hands, eliminating any possibility of tripping the press while the hands are in an unsafe position.

Cleaning Material

A decarbonizer and degreasing material, announced by Kelite Products, Inc., Los Angeles, Calif., is packaged in an open-top five gallon can, with or without parts basket. This material, Kelite parts cleaner,

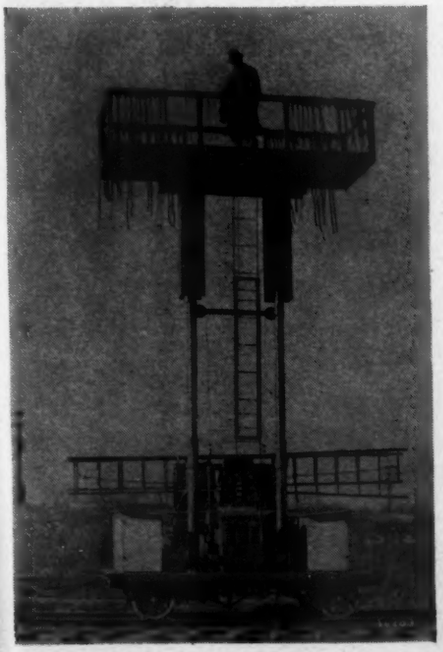
Kelite parts cleaner is used to remove carbon, grease, dyes and gums

is effective for the removal of grease, dyes, gums and carbon. Carbon deposits normally difficult to remove even by such methods as scraping or wire brushing are softened by soaking in the cleaner and can be wiped off with a cloth.

The cleaner is safe for all metals. It is odorless and will not burn or explode. Although it is a safe shop material, operators should wear neoprene gloves, as with all materials of this type. It is used for cleaning pistons, carburetors, fuel pumps and various small parts.

Heavy-Duty Tower Lift

The Bird-White Company, 3119 West Lake street, Chicago, is now in production on a new type heavy-duty tower life for use



The tower lift at its maximum elevation of 22 ft.

in railroad maintenance and some types of railroad construction work. The towers, even at their maximum elevation of 22 ft., are rigid and have very little sidesway. Raising and lowering of the tower is accomplished by twin-hydraulic-mechanical type columns electrically controlled from the platform. There is ample platform working space, and the platform is insulated for 1,500 volts. Power is supplied by a gasoline-driven generator.

Railroad Loudspeaker

A loudspeaker, specifically designed to meet railroad demands has been announced by the Operadio Manufacturing Co., St. Charles, Ill. It has been engineered to produce voice intelligibility and to withstand dirt, wind and water. It is adaptable for mounting on locomotive exteriors, within

The speaker may be used indoors or out for mobile or fixed applications

locomotive cabs and cabooses, or in switchyards.

The speaker is featured by a pressure-neutralizing grill and filter, which eliminates air pressure on the diaphragm when the loudspeaker is used on the exterior of an engine or caboose. What the maker refers to as "slip stream" filtration avoids accumulation of soot or dirt, and the speaker housing is completely sealed and weatherproofed. A waterproof terminal cover permits external connection without opening the unit, and fittings are designed for standard railroad conduit and unions.

Brush Tension Gauge

An aid to quick and accurate setting of uniform commutator-brush spring tension, essential to prevent rapid brush wear or scoring or burning of the commutator, is a brush tension gauge offered by National Electric Coil Company, 794 Chambers Road, Columbus 16, Ohio.

The gauge is an accurate, compact weighing device specially designed for adjusting the tension of carbon brushes.

The tension device applied to a brush spring

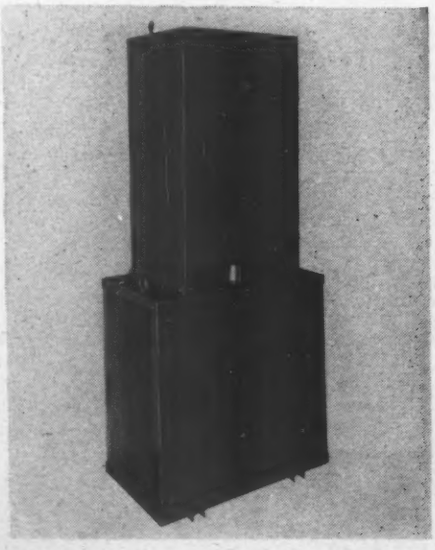
It is equipped with a leather strap and hook as an convenient insulated connection between the brush and the gauge.

To check and adjust the pressure of a brush, the hook is attached to the brush, the brush is raised slightly, and a piece of paper inserted between the brush and commutator. The gauge is then pulled slowly until the paper can be freely withdrawn. The brush pressure is then read on the gauge and adjusted to the correct value.

Gauges of two capacities are offered, Model 06-BT, with a range of 0-6 lb., with 2 oz. graduations, and Model 009-BT, with a range of 0-10 lb., with 4 oz. graduations. Scale figures and graduations are deeply etched for easy reading. Both models are encased in a durable drawn brass tube $1\frac{1}{16}$ in. in diameter.

Power Factor Regulator

The Haug System Power Factor Regulator is announced by the Modern Control Equipment Company, 176 W. Adams street, Chicago. It is designed automatically to control power factor, increasing it when necessary and avoiding the possibility of



The Haug system power factor regulator

over-voltage when the load is light. It has no moving parts and is so designed that third, fifth, and seventh harmonics will not overheat connected capacitors. It also prevents harmonic resonance including telephone interference. The switching of capacitors is eliminated and the regulator may be left on the line 24 hours a day. No discharge coils or other safety devices are required.

1,000-Watt Mercury Lamp

A 1,000-watt, high-intensity mercury-vapor lamp has been announced by the Westinghouse Lamp Division, Bloomfield, N. J. The lamp is air-cooled and has an efficiency

The 60,000-lumen, air-cooled, high-intensity, mercury-vapor lamp is designed for general illumination and for such special purposes as the lighting of welding booths

of 60 lumens per watt. It has an arc stream, about twice as long as a cigaret, enclosed in a quartz tube which, in turn, is enclosed by a hard glass exterior tube. Overall, the lamp measures 14 in. long and is less than 4 in. in diameter.

Equipped with a mogul-screw base, the lamp can be burned in any position. A transformer and reactor are required for its operation.

Hydraulic Press

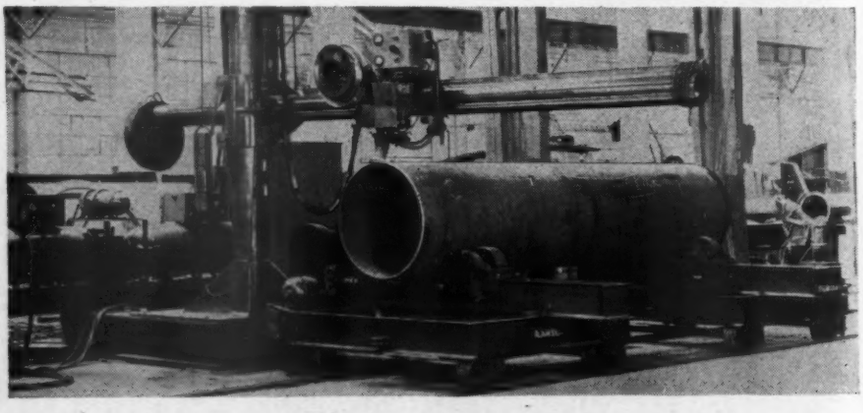
A 200-ton hydraulic press for bending and forming steel parts has been designed by the Lake Erie Engineering Corporation, Buffalo, N. Y. The press is of the C-frame type with a 42-in. right to left and 24-in. back to front die space. It has a 30-in. daylight opening and 16-in. stroke.

The press has a closing speed of 350 in. per min. and a return speed of 345 in. per min. It has a welded-steel housing with an extra-heavy C-frame for minimum deflection under load. The upper or moving platen is rigidly guided for added strength and accuracy and there is a 35-ton cushion in the bed. The press is operated by a hand lever readily accessible to the operator and control of operating speed is obtained by direct stroking of the pump.

Lake Erie 200-ton hydraulic press

Turning Rolls For Automatic Welding

Self-propelled turning rolls, mounted on carriages, for automatic welding production on tanks and cylindrical objects of various lengths and diameters have been designed by the Ransome Machinery Company, Dunellen, N. J., a subsidiary of the Worthington Pump and Machinery Corporation. On circular welds, the weldment is set on the turning rolls and rotated; for longitudinal welds, the work is driven along the track, both at the desired welding speed. The work is thus positioned under the automatic welding head for all welding operations.



Courtesy Struthers Wells Corporation, Warren, Pa.

Ransome self-propelled turning rolls moving a cylinder at welding speed for automatic welding of longitudinal seam

The self-propelled turning rolls consist of two parts, the electric power-driven turning rolls and the idler rolls without power, each mounted on separate carriages. The power drive serves a dual purpose. It rotates weldments for circular welds, and by shifting a clutch, the power is transferred to drive the work forward or reverse on the tracks for welding longitudinal seams. The individual rollers are equipped with tires of industrial-truck-type rubber to prevent bumping when longitudinal welds pass over the rollers.

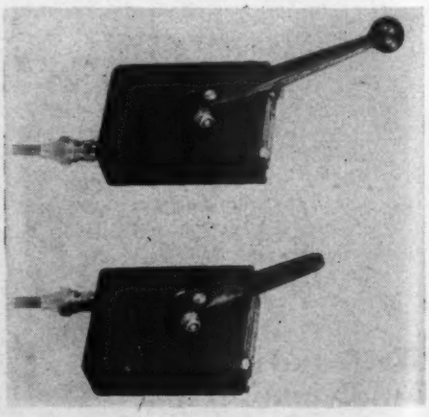
The weight capacity of the turning rolls is 25 tons. The distance between the rollers is adjustable to accommodate 2-ft. to 14-ft. work diameters. The circumferential speed of the rollers and the longitudinal speed of travel of the carriage are adjustable for welding speeds of 7-in. to 57-in. per min. Remote-control of starting, stopping, and reversing both the turning rolls and track carriage, as well as remote speed control, allow the operator to manipulate these functions at his welding position.

Hydraulic Control

Miniature hydraulic remote control has been developed by Sperry Products, Inc., Hoboken, N. J. Numerous applications are possible, but those most frequent are throttle, mixture, governor, and various position-indicator controls.

This product is similar to larger Sperry units in that a single flexible copper tube is used, the system is completely enclosed, and the installation is easily accomplished with but three small bolts for each of the two pieces which make up the complete unit.

The transmitter and receiver, made of bronze, together weigh 3.7 lb. Any motion of the transmitter arm will be duplicated by the receiver arm. Either arm will move through an arc of 60 deg., and the receiver arm may be drilled at any location to obtain the desired linear travel of the actuating rod. The complete system is dust-proof and water-proof. The transmitter and receiver may be joined by 35 ft. of connecting tubing without experiencing any difficulty, and lengths even longer than that may be used where conditions of temperature and load will warrant it.



Transmitter and receiver of the Sperry miniature hydraulic remote control

NEWS

Technical Advisory Board To Aid Transportation Corps

FIFTY-TWO of the nation's outstanding industrial leaders, including many from the railway and railway supply industries, will comprise a Technical Advisory Board to assist the Army Transportation Corps in a research program which will cover all fields of transportation except air, it was announced by the War Department on March 3. Although the board is never expected to meet in its entirety, individual members will consult with Major General Edmond H. Leavey, chief of transportation, to advise and counsel the corps' research and development division.

General Leavey pointed out that the wartime experience gained as the result of transporting men and equipment here and abroad has shown the need for the development of transportation equipment types which have no commercial prototypes. He urged that new equipment be designed, pilot models produced and studies made of actual operations.

Among those named to the board are John E. Dixon, president, Lima Locomotive Works; Duncan W. Fraser, chairman of the board, American Locomotive Company; V. R. Hawthorne, executive vice chairman, Operations and Maintenance Department, Mechanical Division, Association of American Railroads; Edwin Hodge, Jr., chairman, Greenville Steel Car Company; J. M. Hood, president, American Short Line Railroad Association; Ralph Kelly, president, Baldwin Locomotive Works; C. A. Liddle, president, Pullman-Standard Car Manufacturing Company; J. J. Pelley, president, A. A. R.; Ted V. Rodgers, president, American Trucking Associations; Lester N. Selig, vice-chairman of the board of General American Transportation Corporation; and Frederick A. Stevenson, president, American Car and Foundry Company.

Coal Research Budget Increased

DIRECTORS of the Bituminous Coal Research, Inc., national research agency for the bituminous coal industry, have approved a current budget calling for an additional outlay of $401,000 in more than 40 research projects intended to improve utilization of solid fuels by railroads, industry and domestic consumers. The projects under consideration include such railroad coal uses as air supply, over-fire steam-air jets, effect of fuel on locomotive performance, and handling railroad coal.

The research organization's locomotive development committee has announced projects under way or authorized at Battelle Memorial Institute, Johns Hopkins University, Southern Research Institute, the Institute of Gas Technology, Purdue University, and the Alco Products Division of American Locomotive Company. None of these, however, is included in the general budget of $401,000 of Bituminous Coal Research, Inc. The budget for the locomotive development work, the goal of which is a coal-fired gas turbine locomotive, represents a separate allocation of funds.

Transportation Corps Exhibits German Equipment

RAIL equipment consisting of five steam locomotives, one Diesel and several cars of special types captured in Germany was exhibited at Fort Monroe, Va., by the Transportation Corps Board on March 6, 7 and 8 for representatives of science and industry. A special showing was held on March 5 for Congressmen and representatives of the press.

The rail exhibit included an individual-axle-drive streamline locomotive; a condensing locomotive; two standard freight locomotives; a narrow-gauge switching locomotive and a Diesel switching locomotive with a hydraulic transmission. With the exception of the narrow-gauge and the Diesel types all of the locomotives were built by Henschel & Son, Kassel, Germany. Five freight cars were displayed: a standard box car; a 16,645-gallon all-welded tank car; a high-side gondola; a flat car of 80 metric tons capacity and a box car carrying interlocking and signal equipment for the emergency replacement of a damaged wayside control tower.

INDIVIDUAL-AXLE-DRIVE LOCOMOTIVE

The individual-axle-drive locomotive was built in 1941 and operated in passenger service between Hamburg and Berlin until May, 1945. It is a 2-8-2 type locomotive with a maximum tractive force of 36,000 lbs. Each driving axle is powered by a two-cylinder V-type steam engine, two being mounted on the left side at Nos. 1 and 3 driving axles and two on the right side at Nos. 2 and 4 axles. The locomotive is equipped with roller bearings throughout and with force-feed lubrication to the cylinders and valves and to points such as driving-box shoes and equalizer pins. All driving wheels have clasp brakes with two-piece brake shoes.

The condensing locomotive is of the 2-10-0 type built in 1944 for service in bad-water districts or where water is scarce. Tests by the Military Railway Service showed that is could run approximately 700 miles without replenishment of its water supply.

The two standard freight locomotives are essentially of the same design, both being of the 2-8-0 type with their construction adjusted to wartime conditions of manufacture. The Series 52 locomotive was built in 1942 and has a boiler pressure of 227 lb. per sq. in. and a maximum tractive force of 50,320 lb. The Series 42 locomotive was built in 1944 and has a tractive force of 56,000 lb. with the same boiler pressure. Because of the manpower and material shortages many hundreds of component parts were eliminated or modified which resulted in a savings of 6,000 manhours and 26 metric tons of material in the construction of both classes of locomotives as compared to prewar Series 50 locomotives.

DIESEL-HYDRAULIC SWITCHER

The Diesel-hydraulic switching locomotive was built at Strassburg by Maschinenbau & Bahnbedarf. It develops 350 hp. at 600 r.p.m. and is designed to operate at a maximum speed of approximately 40 m.p.h. The six-cylinder four-cycle Diesel engine has a bore of 9¾ in. and a stroke of 13¾ in. and is equipped with a Bosch fuel injection system. The engine is connected through a hydraulic transmission to

Orders and Inquiries for New Equipment Placed Since the Closing of the March Issue

FREIGHT-CAR ORDERS

Road	No. of cars	Type of car	Builder
Illinois Central	100[1]	70-ton covered hoppers	Pullman-Standard
New York, New Haven & Hartford	75	Caboose	Harlan & Hollingsworth
Wheeling & Lake Erie	750	60-ton hopper	American Car & Fdry.
	750	50-ton gondolas	Ralston Steel Car

FREIGHT-CAR INQUIRIES

Pittsburgh & West Virginia	200	70-ton gondola	

PASSENGER-CAR ORDERS

Road	No. of cars	Type of car	Builder
Erie	7[2]	Sleeping	Pullman-Standard
Union Pacific	8[3]	Lunch-counter dining	American Car & Fdry.
	9[3]	Club	American Car & Fdry.
	3[3]	Cafe-lounge	American Car & Fdry.
	13[3]	Dining	American Car & Fdry.
	11[3]	Baggage	American Car & Fdry.
	6[3]	Mail	American Car & Fdry.
	9[3]	Bagg.-dormitory	American Car & Fdry.
	6[3]	Dormitory-club	American Car & Fdry.

[1] To cost approximately $500,000.
[2] To be of lightweight construction and of the six-bedroom, ten-roomette type.
[3] The 65 cars in this order will have aluminum superstructures and will cost $6,000,000. The eight lunch counter-diners will be equipped with soda fountains and dining tables for 40 persons; the nine club cars with showers, barber shops and lounge seats and the six dormintory-club cars with bar and lounge seats. The three cafe-lounge cars will contain 24 seats for dining, 24 lounge seats and an eight-seat card section.

one driving axle. Side rods connect the three pairs of driving wheels.

The narrow-gauge steam locomotive was built by Jung Locomotive Works for the German Army. It is a 0-6-0 type locomotive with a maximum speed of 18¾ m.p.h. and operates on a track gauge of 29⅝ in.

The Freight Cars

All of the freight cars at the exhibit were equipped with Hildebrand-Knorr empty-and-load brakes. The box-car air brakes could also be adjusted for either freight or passenger service, both changes being made by operating small levers located near the side sill. Other features of the freight cars were the ball and socket center plates using no center pins, the wick-feed lubricators for the journal boxes and the use of T-head bolts with the claws of the T forged downward for holding wood siding in place. The lubricators were of very light construction, using a metal pan for holding the oil and a yarn pad held against the journal by a spring with the yarn ends passing through the pad plate into the oil pan.

The standard box car was built at Konisberg, Germany, in 1943. It has a light weight of 28,500 lb., a load limit of 33,000 lb. and a maximum capacity of 38,800 lb.

The 16,645-gallon all-welded cistern of the tank car acts as the underframe for the car. The dome cap is equipped with a single locking device and with one safety valve. The outlet valve is located underneath the car and is joined to a Y-pipe permitting hose connections to be made to either side of the car. The car trucks are also of all-welded construction. The car has a light weight of 40,238 lb.

The high-side gondola is equipped with hinged end gates. This car has a light weight of 22,800 lb., a load limit of 54,000 lb. and a maximum capacity of 56,200 lb.

The flat car was built for carrying armored vehicles and one feature of this car is the adjustable permanent blocking which made it adaptable for transport of either the Tiger or Panzer tanks. The bolts holding the blocking fit into steel grooved plates running crosswise in the car floor which permits adjustment of the blocking either in or out. The car has a light weight of 49,823 lb., a load limit of 176,400 lb. and a maximum capacity of 180,800 lb.

The Marine Exhibit

A marine exhibit was also included with the rail exhibit. It included many Diesel engines, most of which were designed for use in boats although a few were built to power trucks, auxiliary equipment, and switching locomotives.

Three Diesel engines for light switching locomotives included the 112-hp. and 36-hp. Klockner Humbolt Dentz engines, both being of the six-cylinder four-cycle type and a 107-hp. four-cylinder M.A.N. engine operating with a four-stroke cycle. All power ratings are given in metric horsepower.

All of the equipment is available for future inspection by representatives of science and industry. Special arrangements for examining the items can be made through the Office of the Publication Board, Department of Commerce, Washington, D. C.

Microfilms of charts and diagrams will be available on order to O. P. B. Charts and diagrams of some German transportation equipment that was not shipped to the United States also are available, and photostat and microfilm copies may be ordered.

Co-operative Research at Illinois University

More than $52,000 was given to the University of Illinois last year for co-operative research on railroad subjects.

The three largest contributions in railway research during the fiscal year ended June 30, 1945, according to the annual report of the comptroller of the university, were: Association of American Railroads, for study of wheel loads, joint bars, and rail webs, $12,366; Association of American Railroads and American Iron & Steel Institute, for study of failure in rails, $18,522; and Technical Board of the Wrought Steel Wheel Industry, for steel car-wheel research, $10,000. Other subjects of study included welded joints and steel brake shoes.

M. P. Train Radio Licensed

The Federal Communications Commission has granted the application of the Missouri Pacific for construction permit and license for 32 new mobile units to operate as train stations in railroad radio service. Operation will be on the frequency 160.41 megacycles, with 100 watts input to final radio stage, employing special emission for FM (telephony).

Centennial Dinner in Honor of George Westinghouse

Charging that "co-operation between employers and employees and between business men and the public has been systematically undermined by government and by labor-union propaganda," Frank D. Newbury of Pittsburgh, vice-president of Westinghouse Electric Corporation, addressing the American Society of Mechanical Engineers, urged recognition of individual initiative, co-operation of employer and worker, and business leadership as three essentials of a sound national economy. Mr. Newbury spoke at a George Westinghouse centennial dinner, sponsored by the American Society of Mechanical Engineers, of which George Westinghouse was president.

Gwilyn A. Price, president of Westinghouse Electric, announced the company's plans for a forum of leading scientists, engineers and industrialists, which will be held at Pittsburgh on May 16 to 18.

Albert N. Williams, vice-chairman of the board of Westinghouse Air Brake Company, discussed "Westinghouse's Position in the History of Transportation" and Dean Samuel W. Dudley of the Yale School of Engineering spoke on "Westinghouse—the Man." D. Robert Yarnall, president of the A. S. M. E., presided over the meeting, and ex-president Dean Dexter S. Kimball was toastmaster.

Shop Apprentices Systems Under "GI" Bill

Extension to the apprentice systems established in railroad shops under joint labor-management auspices of the provisions for practical training and education of veterans included in the so-called "G. I. bill of rights" has been authorized under an interpretation of the requirements of the statute approved by General Omar N. Bradley, administrator of veterans affairs, according to Veterans' Administration sources.

Some delay in approving such application on a nationwide basis reportedly resulted from uncertainty as to whether it was necessary to secure approval from the various states individually for extension of the provisions for training to such joint apprentice systems.

Santa Fe To Try Out New Music System on Its Trains

As the first experimental test of a plan to provide individual musical wire reproducers, radios and a public address system on its trains, the Atchison, Topeka & Santa Fe has outfitted one of its dining cars with wire reproducing units which will provide various types of music at the will of passengers. The car was placed in transcontinental service on March 10.

According to present plans each roomette, bedroom, compartment and drawing room will be equipped with a push-botton selector, a loud speaker and a volume control which will permit choice of either radio or wire-reproduced popular or semi-classical music. A pilot lamp will notify passengers when the system is turned on so that they may "tune in" at will. As soon as labor and materials are available, similar installations will be made in chair and club-lounge cars as well as in all diners. These installations, however, will differ in that speakers will be placed in the ceilings of the cars to provide an even distribution of sound throughout the car.

Farnsworth Television and Radio Corporation of Ft. Wayne, Ind., designed the over-all integrated system being used in the test dining car, while the Brush Development Company, Cleveland, Ohio, developed the specially designed wire reproducers.

D. & R. G. W. Receives First Railroad Radio Grant

Acting upon the first application for railroad radio authorization submitted pursuant to the establishment of Rules and Regulations Governing Railroad Radio Service, Part 16, the Federal Communications Commission on February 27 granted a construction permit to the Denver & Rio Grande Western for 32 new mobile units as train (end-to-end) stations in this newly established service.

Operation will be on the frequency 159.81 megacycles, with 50 watts input power to final radio stage, employing special emission for FM (telephony).

The F. C. C. announcement noted that extended experimentation has been made regarding use of railroad radio for safety purposes for several years, and many ex-

perimental authorizations have been previously issued to railroads and manufacturers, but this is the first grant since the regular railroad radio service was established by the commission December 31.

Buckwalter to Receive Henderson Gold Medal

THE 1946 winner of the George R. Henderson gold medal of The Franklin Institute is Tracy Vero Buckwalter, according to an announcement on March 11 by Dr. Henry Butler Allen, secretary and director of the institute. Mr. Buckwalter will receive the award "in consideration of his accomplishments in applying anti-friction bearings to railroad locomotives and cars thus contributing to the increase in reliability and decrease in maintenance costs of modern railroad equipment."

The Henderson medal was first awarded in 1928 to William F. Kiesel, Jr., for inventions in locomotive and railway car design and construction. It is given in recognition of meritorious inventions or discoveries in the field of railway engineering.

A photograph and sketch of Mr. Buckwalter, who until last year was vice-president of the Timken Roller Bearing Com, pany of Canton, Ohio, appeared on page 274 of the June, 1945, *Railway Mechanical Engineer*.

Supply Trade Notes

STERLING ENGINE COMPANY.—*Comm. Russell J. Roberts,* U. S. Coast Guard, has been elected assistant to the president of the Sterling Engine Company to succeed *Edward M. O'Connor,* who has retired.

◆

NATHAN MANUFACTURING COMPANY.—The Nathan Manufacturing Company of New York plans to erect a modern factory in Milford, Conn., which it will occupy with its subsidiary, Nathan Aircraft Devices, Inc.

◆

CRUCIBLE STEEL COMPANY OF AMERICA.—*W. M. Stevenson,* sales and service engineer of the Crucible Steel Company of America's railroad division at Cleveland, Ohio, has been appointed manager of the western railway department, with headquarters at Chicago.

◆

FIRTH-STERLING STEEL COMPANY.—*Edwin T. Jackman,* district sales manager of the Firth-Sterling Steel Company in Chicago, has resigned after 18 years of service.

◆

HASKELITE MANUFACTURING COMPANY.—*Gordon D. Beckwith,* a member of the New York district office of the Haskelite Manufacturing Corporation, Grand Rapids, Mich., has been placed in charge of a branch office recently opened at Philadelphia, Pa.

◆

CHICAGO MALLEABLE CASTINGS COMPANY.—*Leon J. Wise,* whose promotion to assistant to the president of the Chicago Malleable Castings Company, with headquarters at Chicago, was reported in the February issue, was born at St. Louis, Mo., on December 26, 1901. He received his higher education at Washington University and began his business career in 1922 as a chemist in the employ of the National Malleable & Steel Castings Co. Two years later he went with the Muncie Malleable Foundry Company as a chemist at Muncie, Ind. In 1926 Mr. Wise resigned to become a metallurgist of the Terre Haute Malleable & Manufacturing Co., at Terre Haute, Ind., and in 1928 became a metallurgist for the Chicago Malleable Castings Company. He was appointed general foreman in 1933, assistant sales manager at Chicago in 1935, manager of industrial sales, and manager of research and development in 1939, and assistant to the executive vice-president in 1943. Mr. Wise is also general manager of the Allied Steel Castings Company, a subsidiary of Chicago Malleable.

PRESSURELUBE, INC.—*William P. Turnesa* has been appointed director of sales of Pressurelube, Inc. Mr. Turnesa recently was discharged from the navy. He was formerly vice-president of the Differential Wheel Corporation.

◆

RELIANCE ELECTRIC & ENGINEERING COMPANY.—*Fred E. Harrell,* general works manager of the Reliance Electric & Engineering Company, Cleveland, Ohio, has been elected a member of the board of directors of the company. *Edward E. Helm,* general sales manager, has been elected sales vice-president.

◆

KROPP FORGE COMPANY.—*Raymond T. O'Keefe, Jr.,* vice-president of the Kropp Forge Aviation Company, has been elected vice-president of the Kropp Forge Company, Chicago. Mr. O'Keefe will be special assistant to the president in matters pertaining to the general operation of the business and also sales representative in the Chicago area.

◆

WITTE ENGINE WORKS.—The Witte Engine Works, a division of the Oil Well Supply Company, Kansas City, Mo., has appointed the T-Z Railway Equipment Company, Chicago, as its national railway sales representative for its Diesel engine and Diesel-electric plants.

◆

GISHOLT MACHINE COMPANY.—The Gisholt Machine Company, Madison, Wis., has purchased the entire machine-tool business of the International Detrola Corporation, of Elkhart, Ind., which it will transfer to Madison.

◆

JONES & LAUGHLIN STEEL CORPORATION.—*H. M. Knobloch,* assistant district sales manager in Cincinnati, Ohio, has been appointed district sales manager in Indianapolis, Ind., for the Jones & Laughlin Steel Corporation. *R. G. Scoggins,* a member of the company's Memphis, Tenn., sales office, has been appointed district sales manager in Los Angeles, Calif., to succeed *T. W. Bell,* who has been appointed special sales representative in Los Angeles. *W. S. Wainright,* a salesman in the wire sales department in Pittsburgh, Pa., has been appointed district sales manager in San Francisco, Calif. *W. L. O'Connell,* resident manager of sales in Indianapolis, Ind., has been appointed resident manager of sales in South Bend, Ind.

DURABLA MANUFACTURING COMPANY.—The Durabla Manufacturing Company has moved its valve plant from its former location in Berwyn, Pa., to a newly reconstructed building at Wayne, Pa.

◆

IDEAL INDUSTRIES, INC.—The Ideal Commutator Dresser Company, a partnership, has been terminated and a new corporation, Ideal Industries, Inc., formed. There has been no change in the management or location of the company.

◆

ASHTON VALVE COMPANY.—The Ashton Valve Company has acquired the Valve division of the Lombard Governor Corporation of Ashland, Mass. This line of valves will be manufactured at the Ashton main plant in Cambridge, Mass. *John F. String,* formerly valve sales manager of the Lombard Governor Corporation and of the Everlasting Valve Company, has joined the Ashton Valve Company.

◆

CORNING GLASS WORKS.—*Russell Brittingham* has been appointed assistant to the vice-president in charge of the bulb and tubing and technical products divisions of the Corning Glass Works. Mr. Brittingham formerly was administrative assistant to the company's associate director of research and development.

◆

RUST-OLEUM CORPORATION.—*J. C. Simmons* has been appointed vice-president of the Rust-Oleum Corporation and will supervise railway supply sales. Mr. Simmons has been associated with Rust-Oleum as general sales representative in the railway supply field. He will make his headquarters at the company's home office in Evanston, Ill. *Robert L. Nutt* has been appointed sales representative in the railway supply field, Atlantic seaboard territory. Mr. Nutt's headquarters are in the National Bank of Commerce Building, Norfolk, Va.

◆

LINK-BELT COMPANY.—*Arthur J. Olson,* district sales engineer for the Link-Belt Company at Chicago, has been appointed district sales manager at Kansas City, Mo., to succeed *Max Giffey,* who has resigned after 40 years of service.

◆

GENERAL RAILWAY SIGNAL COMPANY.—*Roy L. Morris,* formerly general signal inspector of the Missouri Pacific, has been appointed sales engineer of the General Railway Signal Company, with headquarters at St. Louis, Mo.

FIRTH-STERLING STEEL COMPANY.—*Edwin T. Jackman,* district sales manager of the Firth-Sterling Steel Company in Chicago, has resigned after 18 years of service.

◆

SAFETY CAR HEATING & LIGHTING CO.—*E. F. Leherissey* has been transferred to the southwestern district office of the Safety Car Heating & Lighting Co. with headquarters at St. Louis, Mo. Mr. Le-

E. F. Leherissey

herissey has been employed by the Safety Company since 1934. He was an electrical inspector both at the factory and in the field until 1936 and since then a sales representative at Chicago. Prior to his present transfer, he was on leave of absence in war work for two and a half years.

◆

GENERAL FIREPROOFING COMPANY. — *James A. Houston* has been appointed director-eastern contract sales division of the General Fireproofing Company. Mr. Houston has been associated with the company since 1916 in sales engineering work.

◆

AIREON MANUFACTURING CORPORATION. —*Walter A. Bowers* has been elected vice-president and treasurer of the Aireon Manufacturing Corporation. Mr. Bowers formerly was vice-president and treasurer of the Lawrence Aeronautical Corporation of Linden, N. J.

◆

LODGE & SHIPLEY MACHINE TOOL CO.—The Lodge & Shipley Machine Tool Co., Cincinnati, Ohio, has announced the appointment of the Rudel Machinery Company, Inc., Boston, Mass., as exclusive sales representative and dealer in the northeastern states of Maine, Vermont, New Hampshire, Massachusetts and Rhode Island.

◆

WARREN TOOL CORPORATION.—*John J. Gillis,* manufacturers' agent, has been appointed representative in the New England area for the Warren Tool Corporation of Warren, Ohio. Mr. Gillis began his business career as superintendent of fence construction for the Spencer Wire Company. He joined the American Steel & Wire Co. in 1914 and subsequently was appointed manager of sales of the Worcester, Mass., district sales office. He returned to Spencer Wire as vice-president and general manager of sales in 1944 and in December, 1945, entered business for himself as a manufacturers' representative, handling products for the hardware and mill supply jobbers trade.

◆

AMERICAN STEEL & WIRE CO. — *John May,* vice-president in charge of sales of the American Steel & Wire Co., a U. S. Steel subsidiary, has been appointed assistant to the president to aid in general commercial and sales policies. *Harry M. Francis,* assistant vice-president, has been elected vice-president in charge of sales to succeed Mr. May. *B. M. Ashbaucher* has been appointed manager of the electrical, wire rope and construction materials department of the New York sales office of the American Steel & Wire Co., subsidiary of the U. S. Steel Corporation. *C. W. Meyers* has been appointed assistant manager of the wire rope and construction materials division of the company's general sales department in Cleveland, Ohio, to succeed Mr. Ashbaucher. Mr. Meyers also will continue his duties as special representative to the aviation trade.

◆

H. K. PORTER COMPANY; PRESSED STEEL CAR COMPANY.—H. K. Porter Company, Inc. has announced completion of arrangements to sell the fixed assets of its freight-car manufacturing plant at Mt. Vernon, Illinois to Pressed Steel Car Company, Inc. of Pittsburgh. The sale was made in accordance with the Porter policy to further develop its railway specialties business inaugurated in December 1945 with the acquisition of Fort Pitt Spring Company of McKees Rocks, Pa. Porter has entered into a contract to supply Pressed Steel Car Company plants with certain specialties for a period of ten years, according to T. M. Evans, president of Porter.

◆

REYNOLDS METALS COMPANY. — The Reynolds Metals Company has been confirmed as the lessee of the McCook, Ill., government sheet mill for five years with a purchase option. After the housing crisis has eased, the company intends to fabricate aluminum at the plant, principally for the housing and transportaiton industries.

◆

HEWITT RUBBER CORPORATION.—*Tom R. King* has been appointed manager of railway sales of the Hewitt Rubber Corporation, with headquarters at Chicago. *L. C. Holloman,* formerly of the production department of the Hewitt Rubber Corporation, has been appointed to the sales staff in charge of Rest-foam product development and sales to manufacturers in the furniture, transportation and allied fields.

◆

RUST-OLEUM CORPORATION.—The Rust-Oleum Corporation, Evanston, Ill., has appointed three new general agents to represent it in the railway supply field. The new appointments are *C. E. Murphy,* Cleveland, Ohio; *W. W. Fetner,* St. Louis, Mo., and the *Frank B. Nugent Company,* St. Paul, Minn.

◆

OKONITE COMPANY.—The Cleveland, Ohio, district office of the Okonite Company has been moved to the Engineers building.

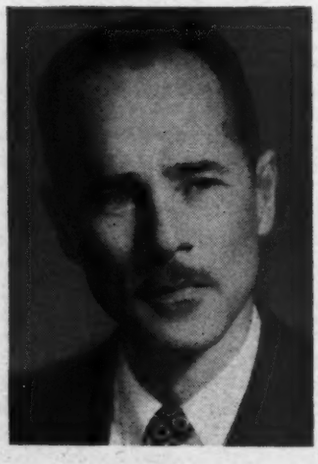
MAGNAFLUX CORPORATION.—On February 11 and 12 the Magnaflux Corporation sponsored a conference at the Congress Hotel, Chicago, attended by about 150 representative railroad men, many of whom spent Wednesday, February 13, at the Magnaflux laboratories, inspecting new equipment and processes used in this non-destructive method of testing railway track and rolling-stock parts. A feature of the conference was the free and extensive interchange of views at the various meetings, the following subjects being discussed by railroad men: Magnaflux Inspection of Track, Tools and Parts During Reclamation, by Ray McBrian, engineer of standards and research, D. & R. G. W.; Inspection of Railroad Car Parts, by C. B. Bryant, assistant to vice-president, Southern; Inspection of Locomotive Parts, by A. H. Ralley, welding supervisor, Canadian Pacific; and Inspection of Diesel Locomotive Parts, by M. C. Haber, mechanical engineer, Union Pacific.

◆

MAGUIRE INDUSTRIES, INC.—*Paul K. Povlsen* has been appointed vice-president and general manager of Maguire Industries, Inc. He will supervise all manufacturing operations of the company and subsidiaries. *Walter B. Scott,* an industrial engineer, who also had been associated with the J. I. Case Company, has joined Maguire Industries as an assistant to Mr. Povlsen. He formerly was associated with the American Can Company.

◆

J. GORDON LIPPINCOTT & CO.—*Hal Bergstrom* has been appointed director of the transportation department of J. Gordon Lippincott & Co. of New York. Mr. Bergstrom will be in charge of integrating all design activities in the transport field.



Hal Bergstrom

For the past three years, Mr. Bergstrom has been a member of the transportation design department of Raymond Loewy Associates. Previously he had served for nine years as chief designer for Montgomery Ward & Co., Chicago.

◆

MARS SIGNAL LIGHT COMPANY.—*A. E. Ganzert,* formerly engineer of shop plants and machinery of the Chicago, Rock Island & Pacific, has been appointed chief engineer of the Mars Signal Light Company, with headquarters at Chicago.

UNITED STATES RUBBER COMPANY.—*Walter F. Spoerl* has been appointed general sales manager of the mechanical goods division of the United States Rubber Company to succeed Herman A. Everlien, who died on February 21 after 43 years of service with the company. Mr. Spoerl began his rubber career 38 years ago as a clerk in the company's sales offices in Chicago. He was promoted through various sales and administrative positions to merchandise manager of the mechanical goods division in 1944.

◆

LAKE ERIE ENGINEERING CORPORATION.—*H. Vander Schilden* has been appointed sales representative in the Chicago district for products of the Lake Erie Engineering Corporation at Buffalo, N. Y.

◆

THE SUPERHEATER COMPANY.—*Arthur Williams,* chief engineer of the Superheater Company, has been elected vice-president in charge of engineering. *T. F. Birmingham,* works manager, has been elected a vice-president in charge of production at East Chicago, Ind. *Charles H. Creasser,* has been appointed assistant works manager at East Chicago and *J. F. Griffin,* assistant chief engineer, has been appointed chief engineer.

Arthur Williams was born in England and educated at Queen's College, Taunton and Swindon and North Wilts Technical Institution. He served as a special apprentice with the Great Western Railway (England) and came to this country in 1926. He was successively associated with

Arthur Williams

the Franklin Railway Supply Company and the Lima Locomotive Works before entering the engineering department of The Superheater Company in September, 1927. He was appointed research engineer in 1930; assistant chief engineer in 1938, and chief engineer in 1942. Mr. Williams is a member of the American Society of Mechanical Engineers, and of the Institution of Locomotive Engineers (London) and an associate member of the Institution of Mechanical Engineers (London).

T. F. Birmingham, before coming with The Superheater Company, was, successively, a machinist apprentice in the employ of the Union Pacific at Omaha, Neb., and an inspector at the Baldwin Locomotive Works for the Harriman Lines. In 1911 he became an inspector for The Superheater Company at builders' plants; in 1916, was appointed superintendent at The Superheater Company's plant, and in 1930

T. F. Birmingham

became works manager. Mr. Birmingham is a member of the American Society for Metals.

Charles H. Creasser received degrees in engineering, economics and law from the Universities of Illinois, Butler, and Indiana. Later he was employed in the mechanical department of the New York Central. During the past four years he served in Washington, D. C., as chief of the Motive Power Section, Transportation Equipment Division, W.P.B., and as chief of the Railway Equipment Branch, Supply Division, Transportation Corps.

J. F. Griffin served as an engineering officer in the United States Navy during World War I. In 1919 he became associated with the engineering staff of the Locomotive Feedwater Heater Company and in 1920 was appointed mechanical engineer. He became a member of the engineering department of The Superheater Company in 1921 and was appointed assistant chief engineer in 1943. Mr. Griffin is a licensed professional engineer in New York and Indiana.

◆

ELECTRIC STORAGE BATTERY COMPANY.—*William Van C. Brandt* has resumed his former position as manager of Exide motive power sales for the Electric Storage Battery Company, Philadelphia, Pa., after serving in the Navy during the war. Mr. Brandt attended the U. S. Naval Academy and served during the first World War in transport service. He re-joined the Navy in 1942 with the rank of lieutenant-commander. He was the commanding officer of the U. S. S. Dover, a gunnery training ship, and in July, 1945, was assigned command of the hospital ship, U. S. S. Sanctuary, with the rank of commander. The Sanctuary was engaged in transporting Allied ex-prisoners of war from China and Japan.

HOUDAILLE-HERSHEY CORPORATION.—*Henry J. Helfrich* has been appointed divisional sales manager of the Houde engineering division of the Houdaille-Hershey Corporation. Mr. Helfrich has been associated with the Houde company since 1938 in the engineering and sales departments.

JUSTRITE MANUFACTURING COMPANY.—*Paul V. Miles,* formerly assistant sales manager, railroad and illuminating department of the Corning Glass Works, has been appointed western manager of the Justrite Manufacturing Company of Chicago. Mr. Miles is located in San Francisco, Calif.

◆

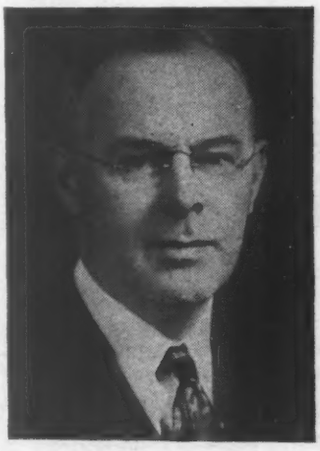
EDGEWATER STEEL COMPANY.—*David W. Odiorne* has been appointed railway engineer by the Edgewater Steel Company, Pittsburgh, Pa., with headquarters at the company's home office in Oakmont, Pa. Mr. Odiorne was a graduate of the Stevens Institute of Technology in 1923 with a degree in mechanical engineering. For the following 19 years he was in the employ of the New York Central. In March, 1942, he was granted a leave of absence for the duration of the war, to assume the position of chief of the rolling section of the Transportation Equipment Division of the War Production Board in Washington, D. C.

◆

GENERAL CABLE CORPORATION.—*Allen D. Pettee* has been appointed chief electrical engineer of the General Cable Corporation.

◆

UNITED STATES STEEL CORPORATION.—*H. Malcolm Priest* has been appointed manager of the railroad research bureau of the four United States Steel Corporation subsidiaries serviced by the bureau. Mr. Priest will supervise research and design in the field of lightweight railroad equipment and other mobile structures. The subsidiaries served are the Carnegie-



H. Malcolm Priest

Illinois Steel Corporation, the Columbia Steel Company, the National Tube Company and the Tennessee Coal, Iron & Railroad Co.

After graduating from Massachusetts Institute of Technology in 1912 with a degree of civil engineering, Mr. Priest was employed by the American Bridge Company as a draftsman. He joined the Chicago, Rock Island & Pacific in 1915 as a designing engineer. He was a research engineer during the first world war and later an assistant professor of structural engineering at Purdue University. He returned to American Bridge in 1923 and served as a designing engineer for ten years. He joined the U. S. Steel railroad research bureau in 1933.

WESTINGHOUSE ELECTRIC CORPORATION. *Gwilym A. Price,* executive vice-president, has been elected president of the Westinghouse Electric Corporation to succeed *George H. Bucher.* Mr. Price will be the chief executive officer. *A. W. Robertson,* who as chairman has been the chief executive officer since 1929, has reached retirement age. He was elected chairman of the board of directors and will continue as a member of the Westinghouse organization in a less active capacity. Mr. Bucher was elected vice-chairman of the board and will continue to serve as chairman of the Westinghouse Electric International Company, which handles all the export business of the parent company, and will have other duties. *L. E. Osborne* has been appointed senior operating vice-president in charge of all manufacturing units of the Westinghouse Electric Corporation. Mr. Osborne's new responsibilities also include all subsidiary manufacturing companies as well as the district manufacturing and repair department and the headquarters manufacturing division of Westinghouse. His office has been transferred to the company's Pittsburgh, Pa., headquarters.

Gwilym A. Price was a graduate of the University of Pittsburgh law school in

Gwilym A. Price

1917. That same year he enlisted as a private in the army and was promoted to a captaincy in a heavy tank battalion which served overseas. After the war, he returned to the practice of law with the firm of Beatty, Magee and Martin, with whom he had served as a clerk while attending law school. He was appointed assistant trust officer of the Pittsburgh Trust Company in 1920 and a trust officer of the Peoples-Pittsburgh Trust Company in 1923. He was elected a vice-president of the latter bank in 1930, its vice-president in charge of trusts in 1937, and president in January, 1940. He was elected vice-president of Westinghouse in September, 1943, a member of the board in January, 1945, and executive vice-president in May, 1945.

◆

IRON & STEEL PRODUCTS, INC.—*J. R. Lawrence,* who recently completed five years of service with the United States Navy, with the rank of commander, has been appointed a representative of the Iron & Steel Products, Inc., in the southwest territory, with headquarters at Tulsa, Okla.

DZUS FASTENER COMPANY.—*L. S. Gilleo* has been appointed sales engineer representative in the Michigan-Ohio-Indiana territory and *L. L. McMaster, Jr.,* representative in the middle Atlantic states, for the Dzus Fastener Company. Mr. Gilleo formerly was associated with the Ford Motor Company at Willow Run. Mr. McMaster previously was employed with the Elastic Stop Nut Company and the Standard Pressed Steel Company.

◆

AMERICAN CHAIN & CABLE CO.—*Wilmot F. Wheeler,* executive vice-president and treasurer, has been elected president of the American Chain & Cable Co. of Bridgeport, Conn., to succeed the late William T. Morris.

◆

DAYTON RUBBER MANUFACTURING COMPANY.—*L. B. Gordon* has been appointed to the new position of director of engineering of the Dayton Rubber Manufacturing Company. This groups all plant, electrical, power, and efficiency engineering as well as machine design and plant layout in one division.

◆

JOHNS-MANVILLE SALES CORPORATION.—*J. A. O'Brien,* vice-president of the Johns-Manville Sales Corporation, a subsidiary of the Johns-Manville Corporation, has been appointed manager of the power products and industrial department. He formerly was general sales manager of that department. *H. R. Berlin* and *C. G. Dandrow* have been elected vice-presidents of the Johns-Manville Sales Corporation. Mr. Berlin has been appointed manager of the building materials and general department and Mr. Dandrow general sales manager of the power products and industrial departments.

◆

LESLIE COMPANY.—*Russell W. Boettiger* has been appointed sales manager of the Leslie Co., Lyndhurst, N. J. Mr. Boettiger is a graduate of Cornell University with a degree in mecchanical engineering. He joined the Leslie organization in 1936 as sales and service engineer. Prior to that he was in plant engineering with the Gen-

Russell W. Boettiger

eral Foods Corporation. In 1942 he was appointed chief planning engineer in charge of coordinating production with the requirements of the wartime shipbuilding program.

Obituary

COL. E. J. W. RAGSDALE, chief engineer of the railway division of the Edward G. Budd Manufacturing Company, died of a heart attack on February 24, as announced in the March issue. Colonel Ragsdale was 61 years of age. He was born in San Francisco, Calif., and spent his boyhood in China, where his father was in the United States diplomatic service; in Flushing, Long Island, N. Y., and in Berlin, where he studied for a degree in naval architecture. He enlisted in the British army at the age of 15 while in Tientsin, China, to help quell the Boxer uprising. He was wounded and smuggled to Japan where he recovered after three months. He went to Germany in 1903 and mixed study with travel through Russia and Switzerland. He worked in a German shipyard and on a British tramp steamer to the Orient. After a course in ship-

Col. E. J. W. Ragsdale

building at the Massachusetts Institute of Technology, he was commissioned in the United States army in 1910. Shortly after World War I, he resigned his commission and joined the Budd Company as a research engineer. In that capacity and later as chief engineer of the railway division, he promoted the use of four-wheel brakes for automobiles, invented the Shotweld system, which made possible Budd's varied use of stainless steel, and developed many of the design and comfort features of the streamline stainless-steel railroad passenger cars. Recently he was active with the company's post-war production of railroad cars. He travelled 50,000 miles on the railroads in one year to gather material and experiences helpful in his research.

◆

JOHN A. ENGLISH, JR., manager of Detroit sales of the Carnegie-Illinois Steel Corporation, died at Detroit, Mich., recently.

◆

W. JERRY KING, manager of railway sales of the Hewitt Rubber Corporation, and owner of the O. K. Company, Chicago, died at Winter Park, Fla., on February 16. Mr. King was born at Chicago on November 27, 1875, and began his career with the Hewitt Supply Company. In 1915 he left this firm and went with the Hewitt Rubber Corporation, which maintains headquarters at Buffalo, N. Y. In November,

AMCCW MAKES AN EXTRA CHECK FOR ROTUNDITY

Figure One

Figure Two

Wheels tested at depth-of-wear

Not only is a wheel's original rotundity assured by rigid AMCCW tests, but an additional rotundity check is made at the same time to ascertain the wheel's hardness at the depth-of-wear permitted by the AAR tread worn hollow gauge and hence insure the maintenance of rotundity throughout the life of the wheel.

The average of three Brinell hardness tests — one made at each of the points indicated in Figure One — is part of this extra check. To pass this test, wheels must have an average tread hardness of 352. Moreover, this triple-average test at the depth-of-wear is made on the fracture having the lowest depth of chill as determined by visual examination of several fractures located at equidistant points on the tread's circumference. (See Figure Two.)

As a result of these checks, assurance is given of long, uniform wear and maintenance of rotundity. Other tests which are part of the regular procedures of every AMCCW member include chill test block taken at least once in every ten wheels poured . . . . one complete chemical analysis block with each heat . . . constant pyrometer checks for accurate process temperature . . . drop test of finished wheel (AAR specifications) . . . thermal test of finished wheel (AAR specifications).

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS

1919, he founded the O. K. Company, but retained his connection with Hewitt, with headquarters at Chicago.

◆

HERMAN A. EVERLIEN, general sales manager of the mechanical goods division of the United States Rubber Company, died on February 21. Mr. Everlien had served with the company for 43 years.

◆

FRANK PARKER, chairman of the board of Iron & Steel Products, Inc., Chicago, died in a hospital in that city on March 17.

◆

JOHN P. LANDRETH, president and treasurer of the Spring Packing Corporation, Chicago, died on February 27. Mr. Landreth was born at Beloit, Wis., on August 11, 1883. He received his higher education at the Missouri Military Academy, Mexico, Mo., and began his business career by working for various public utility companies in Joplin, Mo., Corthage and St. Louis, later going with the Denver & Rio Grande Western at Salida, Colo. In 1904 Mr. Landreth became a salesman in the employ of the Garlock Packing Company, with headquarters at Kansas City, Mo., and St. Louis. Four years later he was appointed Chicago manager, with headquarters in Chicago. In 1916 he became western sales manager of the Anchor Packing Company at Chicago, and in 1923 was elected president and treasurer of the Spring Packing Corporation.

◆

JOHN Y. SLOAN, 74, vice-president of the Pullman-Standard Car Manufacturing Company, died on March 13 at his home in Highland Park, Ill. Mr. Sloan was a native of Buffalo, N. Y., and a graduate of Cornell University. He became associated with Pullman in 1901 at the Buffalo repair shop. He was later, successively, assistant to the general foreman of the St. Louis, Mo., shops; mechanical inspector, Buffalo Works; mechanical inspector, Chicago office, and assistant engineer at the Pullman Car Works. On January 1, 1915, he was appointed sales agent, Chicago office, and in 1925, manager of sales at Chicago. In 1926 he moved to New York as eastern manager of sales and became vice-president in 1928. Mr. Sloan returned to Chicago in 1932. He was a member of the New York Railroad Club, the Western Railway Club of Chicago, the Pullman Twenty Year Service Club, Railway Business Association, and many other clubs and associations allied with the railroad business.

Personal Mention

General

H. T. COVER, general superintendent of the Eastern Ohio division of the Pennsylvania, with headquarters at Pittsburgh, Pa., has been appointed chief of motive power of the system, with headquarters at Philadelphia, Pa., succeeding the late H. W. JONES, a photograph and a biographical account of whom appears on page 235 of this issue. Mr. Cover was born in Altoona, Pa., on August 25, 1897, and is a graduate of Pennsylvania State College in electrical engineering. He first served the Pennsylvania for two weeks as a laborer during August, 1915, at Altoona, where he was subsequently a boilermaker's helper and then draftsman in the office of general superintendent motive power. In 1920 he became special apprentice in the Altoona works; in 1922, motive-power inspector at Philadelphia, Pa.; in 1923, assistant shop foreman at New York, and, in 1924, foreman there, transferring to Philadelphia in 1927 and to East Altoona in 1929. He was appointed assistant master mechanic on the Maryland division in 1931, and master mechanic, Buffalo division, N. Y., in 1934. He was subsequently transferred to the Maryland, and the Columbus, Cincinnati and Toledo divisions, successively. Mr. Cover was appointed superintendent of the Wilkes-Barre division, with headquarters at Sunbury, Pa., in 1940, and superintendent of freight transportation, Eastern region, Philadelphia, in 1942. Later in 1942 he became general superintendent. His appointment to the position of chief of motive power of the system became effective March 14.

H. T. Cover

◆

G. J. STRONG, superintendent of motive power of the Virginian at Princeton, W. Va., has retired after 36 years of service.

◆

E. J. CRAWFORD, superintendent motive power, Western district, of the Chicago & North Western at Chicago, has been granted a leave of absence.

◆

L. C. KIRKHUFF, assistant superintendent motive power of the Virginian at Princeton, W. Va., has been appointed superintendent motive power, with headquarters at Princeton. The office of assistant superintendent motive power has been abolished.

◆

J. C. STUMP, superintendent of motive power, Northern division, of the Chicago & North Western at Chicago, has had his jurisdiction extended to include all locomotive and car matters on the Western district, comprising the following divisions: Galena, Iowa, Northern Iowa, and Western Lines.

◆

J. E. HUNTER has been appointed acting superintendent of motive power of the Chicago & North Western, with headquarters in Chicago. Mr. Hunter will have jurisdiction over all locomotive and car matters on the Northern district comprising the following divisions: Terminal, Wisconsin, Lake Shore, Peninsula, Madison, Ashland, and Dakota.

◆

G. A. MARRIOTT, special engineer of the Chesapeake & Ohio at Richmond, Va., retired on December 31. Mr. Marriott was born on January 11, 1880, at Richwood, Ohio. He entered the service of the C. & O. in April, 1901, as a machinist apprentice at Huntington, W. Va., and Clifton Forge, Va. He became a machinist at Clifton Forge in 1905; draftsman and inspector at Richmond in March, 1912; draftsman in December, 1912; he was named locomotive inspector in May, 1913; equipment inspector in September 1913, and valuation inspector in June 1916. In 1918 Mr. Marriott was appointed corporate master mechanic, and in 1924 office engineer in the mechanical department at Richmond. He was transferred to Huntington in 1930 and returned to Richmond in May, 1940 as special engineer.

◆

ALDEN B. LAWSON, whose appointment as mechanical engineer of the Baltimore & Ohio, with headquarters at Baltimore, Md., was announced in the March issue, was born in Somerset County, Md., on December 16, 1887. He entered the service of the B. & O. in 1909 as a junior engineering draftsman. He was promoted to engineering draftman in the locomotive department in 1910, and transferred to the passenger-car department in 1918, where he became leading engineering draftman, in charge of design and development, in 1919. In 1927, Mr. Lawson was appointed assistant engi-

Alden B. Lawson

Only because the railroads are able to move heavier trains on faster schedules than ever before, are they able to handle today's traffic.

For both freight and passenger service, this requires the use of modern locomotives, designed for economical operation on long runs, as is this Lima-built 4-8-2 of the New York Central Lines.

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neer, passenger-car department, in charge of design and development; in 1942, chief engineering draftman in charge of design and development of locomotives, freight and passenger equipment cars and shops, and mechanical engineer on January 1, 1946.

GEORGE CHARLES HOEY, who has been appointed assistant mechanical engineer of the Bessemer & Lake Erie at Greenville, Pa., as announced in the March issue, received his B.S. in M.E. from Purdue University in 1916 after specializing in railway mechanical engineering. His first railroad experience was in air-brake work on the Pennsylvania during the summer of 1914. From 1916 to 1920 he was a special apprentice on the Atchison, Topeka & Santa Fe. During 1918-19 he served with the U. S. Army Transportation Corps in France working on locomotive and car design, drafting, and shop layout. He also attended the A.E.F. University at Beaune,

G. C. Hoey

France, in 1919. Mr. Hoey returned to the Santa Fe in 1920 and served successively as a machinist, motive-power inspector, apprentice instructor, and enginehouse foreman until 1921 when he entered the tool design department of the Indiana Tool Company. In 1922 he began his career with the B. & L. E. and was successively engaged in locomotive and car drafting and designing, computation, materials checking, shop checking and inspection work until his appointment as assistant mechanical engineer. Mr. Hoey collaborated in 1926 with F. M. A'Hearn in a series of lessons on railway shop practice for the Railway Training Institute in Chicago, and since 1922 has been teaching various night-school classes in machine-shop practice, blue-print reading, shop arithmetic and mechanical drawing at the shops of the B. & L. E., at the Greenville High School, and at Thiel College at Greenville.

CHESTER K. JAMES, whose appointment as assistant superintendent motive power of the Erie, with headquarters at Cleveland, Ohio, was announced in the March issue, was born at Huntington, Ind., on October 16, 1901. Mr. James is a graduate of Cornell University. He entered the service of the Erie in 1924 as a special apprentice at Meadville, Pa., advancing to leading machinist in 1927 and foreman in 1929. He went to Kent, Ohio, as engine-

C. K. James

house foreman in 1930, to Jersey City, N. J., as motor equipment inspector in 1933, to Susquehanna, Pa., as master mechanic-motor equipment in 1938, and to Buffalo, N. Y., as master mechanic in 1942. Mr. James was appointed district master mechanic at Meadville in April, 1944 and assistant superintendent of motive power on January 16, 1946.

JAMES H. WILSON, assistant chief mechanical officer of the Norfolk Southern, at Norfolk, Va., has been appointed chief mechanical officer at Norfolk. Mr. Wilson was born at Valdosta, Ga., and entered railroading at Tallahassee, Fla., in 1904 as a machinist apprentice in the employ of the Seaboard Air Line. He subsequently served the Atlantic Coast Line in the mechanical

James H. Wilson

and electrical departments from 1909 to 1917, when he joined the Norfolk Southern as chief electrician. In March, 1934, he became chief mechanical inspector and assistant superintendent motive power. He was appointed assistant chief mechanical officer in 1937 and chief mechanical officer on January 25, 1946. The position of assistant chief mechanical officer has been abolished.

L. A. MCALLISTER has been appointed mechanical engineer of the Alton with headquarters at Chicago. Mr. McAllister was born in Great Falls, Mont., March 20, 1903. He is a graduate of Purdue University (1926). On July 1, 1926, he entered railroad service as a special apprentice in the car department of the Chicago, Milwaukee, St. Paul & Pacific at Minneapolis, Minn. He left the Milwaukee in November, 1930, to become time-study engineer for the A. O. Smith Corporation, Milwaukee, Wis. On February 1, 1939, he resigned this position and became mechanical inspector in the test department of the Milwaukee at Milwaukee. He served as mechanical inspector in charge of dynamometer-car and power-plant testing until his appointment on the Alton.

Master Mechanics and Road Foremen

H. D. EGGLESTON, road foreman of engines of the Reading at Reading, Pa, has retired.

R. G. CIKANEK has been appointed master mechanic of the Dakota division of the Chicago & North Western.

T. O. GUSTAFSON has been appointed acting road foreman of engines, Galena division, of the Chicago & North Western, with headquarters in Chicago.

ARLOW E. JOHNSTON has been appointed acting assistant master mechanic of the Galena division, southern district, of the Chicago & North Western, with headquarters at South Pekin, Ill.

F. A. CUTTER has been appointed acting master mechanic of the Madison division of the Chicago & North Western, with headquarters in Milwaukee, Wis.

F. J TOPPING, master mechanic of the Chesapeake & Ohio at Columbus, Ohio, has been transferred to the position of master mechanic at Huntington, W. Va.

B. M. SWANK, assistant train master-assistant road foreman of engines, Renovo, division of the Pennsylvania, has been appointed assistant road foreman of engines, Buffalo division.

W. D. RICHARDS, foreman of the enginehouse of the Reading at Bridgeport, Pa., has been appointed master mechanic of the Reading division, with headquarters at Reading, Pa.

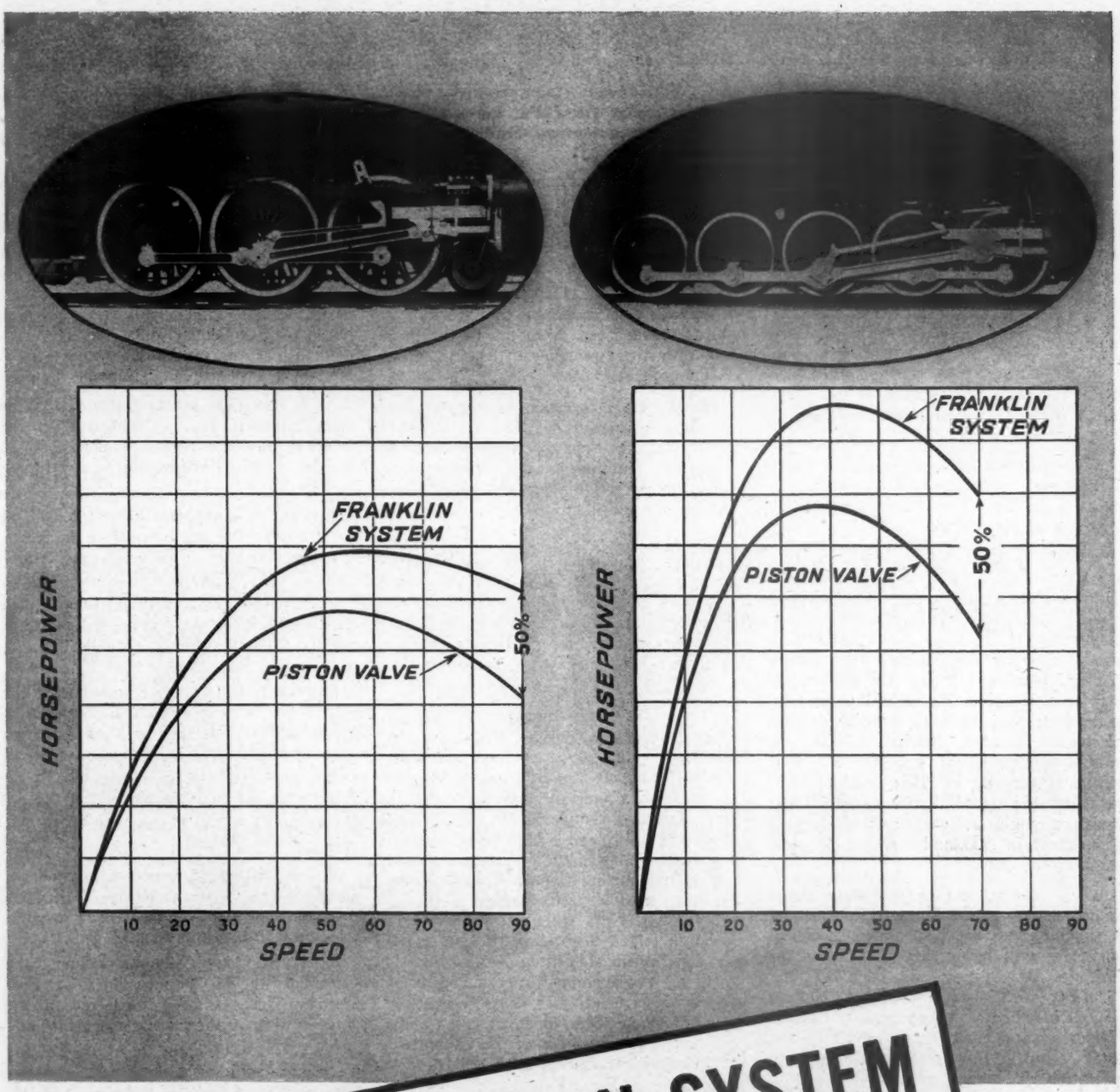
E. R. HANNA, who has been on leave of absence on account of sickness, has returned to the Missouri Pacific as master mechanic, with headquarters at Nevada, Mo.

J. E. MCLEOD, master mechanic of the Chesapeake & Ohio at Peru, Ind., has been transferred to the position of master mechanic, Hocking division, with headquarters at Columbus, Ohio.

N. F. KOEPKE has been appointed acting road foreman of engines of the Wisconsin division of the Chicago & North Western, with headquarters at Milwaukee, Wis.

Electrical

WILLIAM FOREST FREUTEL, whose appointment as special engineer of the Chesapeake & Ohio, with headquarters at Richmond, Va., was announced in the February issue, was born on April 15, 1905, at Huntington, W. Va. He is a graduate of West Virginia University (1917). He entered railroading in March 1917, as an electrician



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in the employ of the Chesapeake & Ohio. In 1921, he was advanced to foreman, electrical department, at the Huntington shops, then in 1924, to supervisor, train lighting. Mr. Freutel became general electrical inspector in 1929; assistant electrical engineer in 1942, and special engineer on January 1, 1946.

H. W. HESSER, electrician, Maryland division, of the Pennsylvania, has been appointed gang foreman—electric locomotive shop, at Wilmington, Del.

FRANK A. ROGERS, electrical supervisor of the New York, New Haven & Hartford, has been appointed assistant electrical engineer at New Haven, Conn.

R. H. GIBSON has been appointed electrical foreman, Coast Lines, of the Atchison, Topeka & Santa Fe, with headquarters at Los Angeles, Calif.

G. S. GLAIBER has been appointed assistant general supervisor car electrical equipment of the New York Central, with headquarters at New York.

GEORGE T. JOHNSON, assistant electrical engineer of the New York, New Haven & Hartford at New Haven, Conn., has retired. Mr. Johnson, who was born on September 11, 1875, at New Haven, is a graduate of the Sheffield Scientific School, Yale University (1896). He entered the service of the New Haven in 1904 as foreman electrician, becoming general foreman electrician, Western district, in 1907. He was appointed signal inspector in 1912; electrical inspector in 1915; assistant engineer in 1916; electrical supervisor in 1919; assistant engineer, electrical engineering department, in 1923, and assistant electrical engineer in 1925.

L. C. BOWES, engineer of shop plants and machinery of the Chicago, Rock Island & Pacific, has been appointed electrical engineer, with headquarters as before at Chicago. Mr. Bowes was born on June 23, 1890, at Minneapolis, Minn. He received his higher education at Cornell University and entered the service of the Rock Island in July, 1916, as an inspector of stationary boiler plants, serving in this capacity until December, 1922, except for a period during World War I when he was a private and sergeant in military service overseas. At the end of this period he became production engineer. On July 1, 1926, he was appointed general piecework supervisor, and in August, 1936, engineer of shop plants and machinery.

Car Department

C. B. STEMPLE has been appointed general car foreman of the Chicago & North Western at Proviso, Ill.

C. C. NASH has been appointed general supervisor car repairs of the Chicago & North Western at Chicago.

C. W. HARTMAN, assistant foreman, Middle division, of the Pennsylvania, has been appointed foreman, car inspectors, Wilkes-Barre division.

R. L. SCANLAND, inspector-car, Maryland division, of the Pennsylvania, has been appointed gang foreman, relief, at Baltimore, Md.

W. T. CARBIS, inspector-car, Maryland division, of the Pennsylvania, has been appointed gang foreman at Baltimore, Md.

J. W. RATHVON, gang foreman of the Pennsylvania at Enola, Pa., has been appointed assistant foreman, Enola steel car shop.

W. H. HARTNETT has been appointed general car foreman of the Chicago & North Western at Milwaukee, Wis. Mr. Hartnett was formerly general car foreman at Proviso, Ill.

C. A. PAXTON, shop inspector in the Roanoke, Va., shops of the Norfolk & Western, has been promoted to the position of gang foreman, car department at Williamson, W. Va.

H. M. VISE, foreman, car department, of the Chesapeake & Ohio at Newport News, Va., has been appointed general car inspector, Huntington and Hinton divisions (except Hinton proper), with headquarters at Huntington, W. Va.

ARTHUR W. HESELTON, former car department foreman of the Boston & Maine at North Station, Boston, Mass., has been appointed assistant shop superintendent of the B. & M. at Concord, N. H. Mr. Heselton recently returned from service as a major in the Army Transportation Corps.

PETER KASS, superintendent of the car department of the Chicago, Rock Island & Pacific, at Chicago, has retired. Mr. Kass was born at Antwerp, Belgium, on August 11, 1879. He came to this country at an early age, and completed his high school education in 1894. He became an apprentice in the shops of the Pullman-Standard Car Manufacturing Company, and rose to the position of chief mechanical inspector. In 1912 Mr. Kass entered the service of the Rock Island as general foreman in the car department at Chicago. On July 1, 1924, he was appointed superintendent of the car department. Mr. Kass was active in the Mechanical Division of the A. A. R., and served as a member of the Committee on Prices for Labor and Materials.

Shop and Enginehouse

W. C. STANCIL has been appointed lubrication inspector of the Atlantic Coast Line, with headquarters at Wilmington, N. C.

V. L. MINNICK, gang foreman at the Petersburg, Va., shops of the Norfolk & Western, has been promoted to the position of foreman at Durham, N. C.

H. C. MOORE, gang leader at the Petersburg, Va., shops of the Norfolk & Western, has been promoted to the position of foreman at Petersburg.

J. F. KESSLER, temporary gang foreman of the Norfolk & Western at Columbus, Ohio, has been promoted to the position of gang foreman, car department, at Columbus.

C. C. GODSEY, gang leader in the Roanoke, Va., shops of the Norfolk & Western, has been promoted to the position of night boiler maker foreman at Bluefield, W. Va.

J. W. COX, foreman at the Lynchburg, Va., shops of the Norfolk & Western, has retired.

W. E. HARMAN, foreman at the Durham, N. C., shops of the Norfolk & Western, has been transferred to the position of foreman at Lynchburg, Va.

A. J. MULROONEY, foreman at the South Philadelphia, Pa., enginehouse of the Pennsylvania, has been appointed foreman at the Forty-Sixth street, Philadelphia, enginehouse—Philadelphia Terminal division.

J. H. MUNTZ, foreman at the Forty-Sixth street, Philadelphia, Pa., enginehouse of the Pennsylvania, has been appointed foreman, special duty, office master mechanic, Philadelphia Terminal division.

J. T. PENMAN, assistant foreman at the East Altoona, Pa., enginehouse of the Pennsylvania, has been appointed foreman at the South Philadelphia, Pa., enginehouse.

EDWARD CARNES, assistant foreman at the Pitcairn, Pa., enginehouse of the Pennsylvania, has been appointed assistant foreman at the East Altoona, Pa., enginehouse.

H. L. CRIST, gang foreman, Philadelphia division, of the Pennsylvania, has been appointed assistant foreman, Middle division, at Altoona, Pa.

ERNEST J. KELLY, chief inspector at the Van Nest shops of the New York, New Haven & Hartford at New York, has been appointed assistant superintendent at Van Nest.

W. J. BARBER, locomotive foreman of the Canadian Pacific at Cranbrook, B. C., has retired.

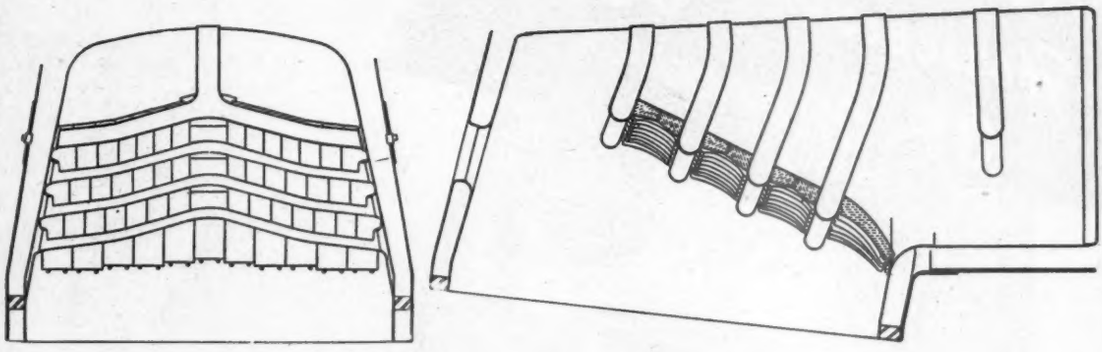
W. A. SILVER, locomotive foreman of the Canadian Pacific at Regina, Sask., has been transferred to the position of locomotive foreman at Cranbrook, B. C.

F. W. STEVENSON, shop foreman of the Canadian Pacific, western lines, at Fort William, Ont., has been transferred to the position of shop foreman at Kenora, Ont.

W. F. THOMAS, night chargehand of the Canadian Pacific at Field, B. C., who has been with the Canadian Navy since April, 1942, has been appointed shop foreman at Fort William, Ont.

Obituary

HARRY W. JONES, chief of motive power of the Pennsylvania at Philadelphia, Pa., who died on February 23, as noted in the March issue, was born at Northumberland, Pa., on December 30, 1884. He entered the employ of the Pennsylvania in 1903 as a machinist apprentice in the Sunbury, Pa., shops. He became assistant enginehouse foreman at Sunbury in 1908, and enginehouse foreman at Renovo, Pa., in 1911. He served as shop inspector and as general foreman at various points from 1912 until 1917, when he was promoted to the position of assistant master mechanic at Wilmington, Del. From 1918 to 1929 he was master mechanic at Sunbury, Renovo, and Altoona, Pa., successively. In 1929 he was appointed superintendent motive power, Western Pennsylvania division at Pittsburgh, Pa.; in 1930, general superintendent motive power, central region, at Pittsburgh, and



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in 1933 general superintendent at Indianapolis, Ind. Mr. Jones was transferred to

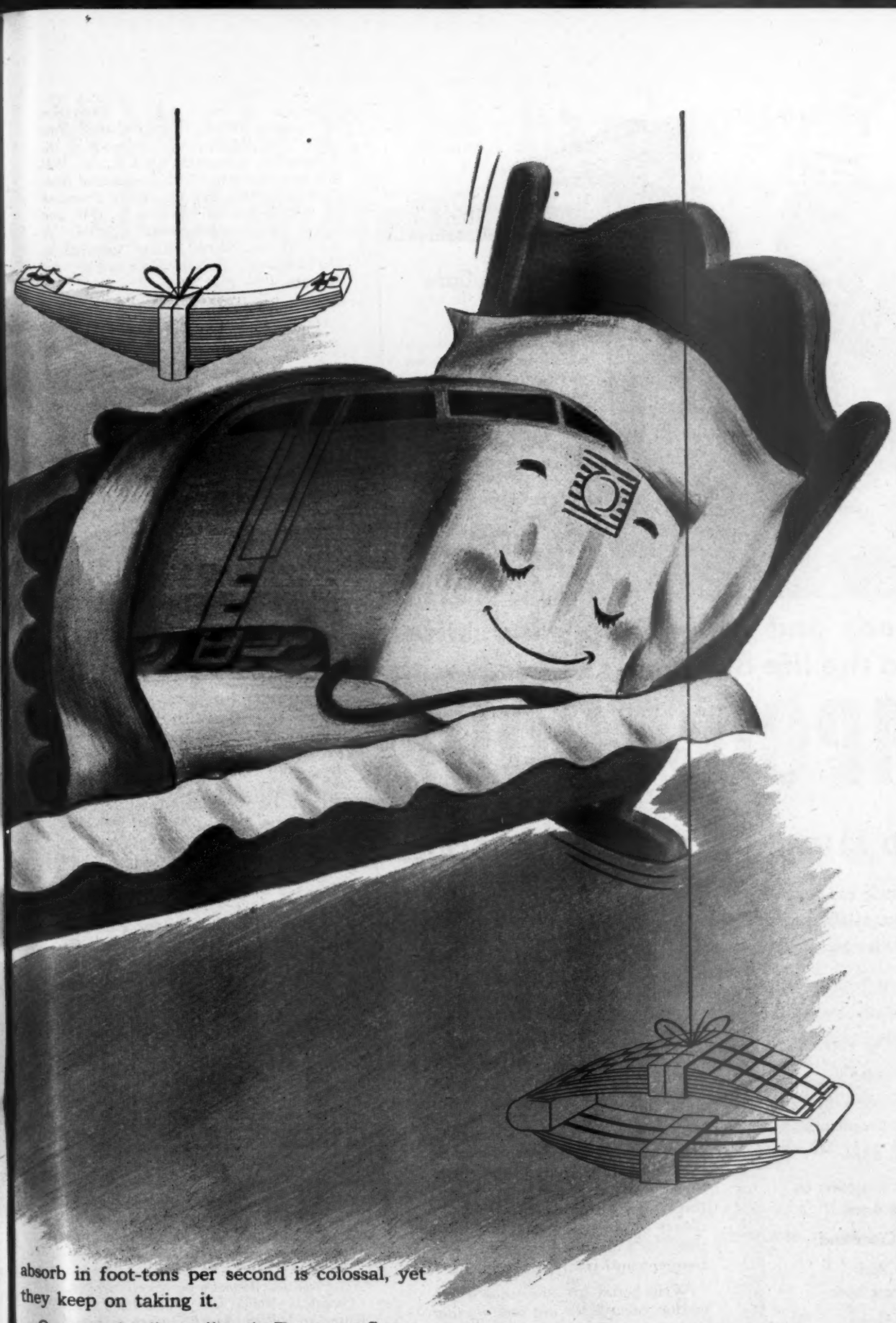
Harry W. Jones

Harrisburg, Pa., in 1937, and became chief of motive power at Philadelphia on February 1, 1941. ◆

WALTER H. FLYNN, general superintendent motive power and rolling stock of the New York Central System, died suddenly on March 14 of a heart attack in his hotel room at Washington, D. C., following attendance at a conference of the Association of American Railroads. Mr. Flynn was born in Buffalo, N. Y., on June 24, 1877, and was a graduate of Michigan State College, with a degree of B.S. in mechanical engineering, in 1899. He began his railway career in September, 1899, with the Cleveland, Lorain & Wheeling (now the Baltimore & Ohio). He became a draftsman in the mechanical engineer's office of the Michigan Central on September 1, 1900; assistant general fore-

Walter H. Flynn

man at the Jackson, Mich., locomotive shops on March 1, 1902, and general foreman on February 1, 1905. He became master mechanic at St. Thomas, Ont., on September 1, 1907, and superintendent of motive power at Detroit, Mich., on June 1, 1912. On April 16, 1925, he was appointed superintendent motive power of the New York Central, Lines East, with headquarters at New York; in September, 1926, general superintendent motive power, New York Central, and in January, 1927, general superintendent motive power and rolling stock, New York Central System. Mr. Flynn had been a member of the Joint



absorb in foot-tons per second is colossal, yet they keep on taking it.

On many leading railroads, RAILWAY STEEL SPRINGS are consistently proving their marvelous ability to absorb punishment.

Railroad Popularity Rides On Springs

Check this Case History

Material welded: Cast steel driving box on a locomotive. *Welding procedure:* Using 3/8" Ampco-Trode 10 at 425 Amperes and a slight surface preheat, the overlay was formed by weaving beads from 1" to 1½" in width and built to height of 1¼". 67 lbs. of electrode were used; seven hours of welding time required. *Results:* A long-wearing bearing surface overlaid with a minimum of cost, labor, and time.

Railroads and other heavy industries extend the life of mating surfaces with

AMPCO-TRODE

REG. U. S. PAT. OFF.

COATED ALUMINUM BRONZE ELECTRODES

Ampco-Trode has been used successfully on the following:

- Driving Box Face
- Steel Piston Heads
- Steel Pop Valve
- Fabricate Oil Cellars
- Valve Crossheads
- Trailer Boxes
- Worn Shoulders on Crown Brass
- Steel Crosshead
- Brake Rod Equalizer Ends
- Wear Shoes
- Bumper or Chafing Plates
- Spring Carriers and Hangers.

This is the way railroads are building long-wearing surfaces on frictional parts. Another outstanding operating railroad has standardized on Ampco-Trode 200 for overlaying engine roller-bearing shoes because *"it has proved itself over and above softer bronzes."*

You can select Ampco-Trode electrodes on their record — with full knowledge that superior strength, higher hardness and wear resistance will be in evidence when you make your trial-run check. On all parts subject to wear, fatigue, or corrosion, specify Ampco-Trode. It lasts three to five times longer than ordinary bronzes . . . you cut "down time" to a minimum . . . you avoid frequent and costly replacement.

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Ampco Metal, Inc.

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Committee of the A.A.R. on Utilization of Locomotives and Conservation of Fuel since 1934. He became a member of the Arbitration Committee, A.A.R., in 1931 and was chairman of that committee from 1933 until 1940. He was elected chairman of the Mechanical Division in 1940 and served until his resignation in 1944. A study of Mr. Flynn's career appeared in the *Railway Mechanical Engineer* for January, 1943, page 13.

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers, preferably on company letterhead, giving title. State the name and number of the bulletin or catalog desired, when it is mentioned.

PORTABLE ELECTRIC JACKS.—Whiting Corporation, Harvey, Ill. Two-page Bulletin PJ-C-401 shows the Whiting portable electric jacks in the operation of removing wheels, and power trucks and repairing motors on Diesel-electric switching locomotives.

◆

DRIVING-BOX BORER AND FACER.—The Bullard Company, Bridgeport 2, Conn. Six-page illustrated folder describes the Bullard Standard Cut Master vertical turret lathes for railroad jobs. Specifications show the machine will chuck boxes up to 23½ in. long and will grip 21¾ in. maximum width between jaw faces.

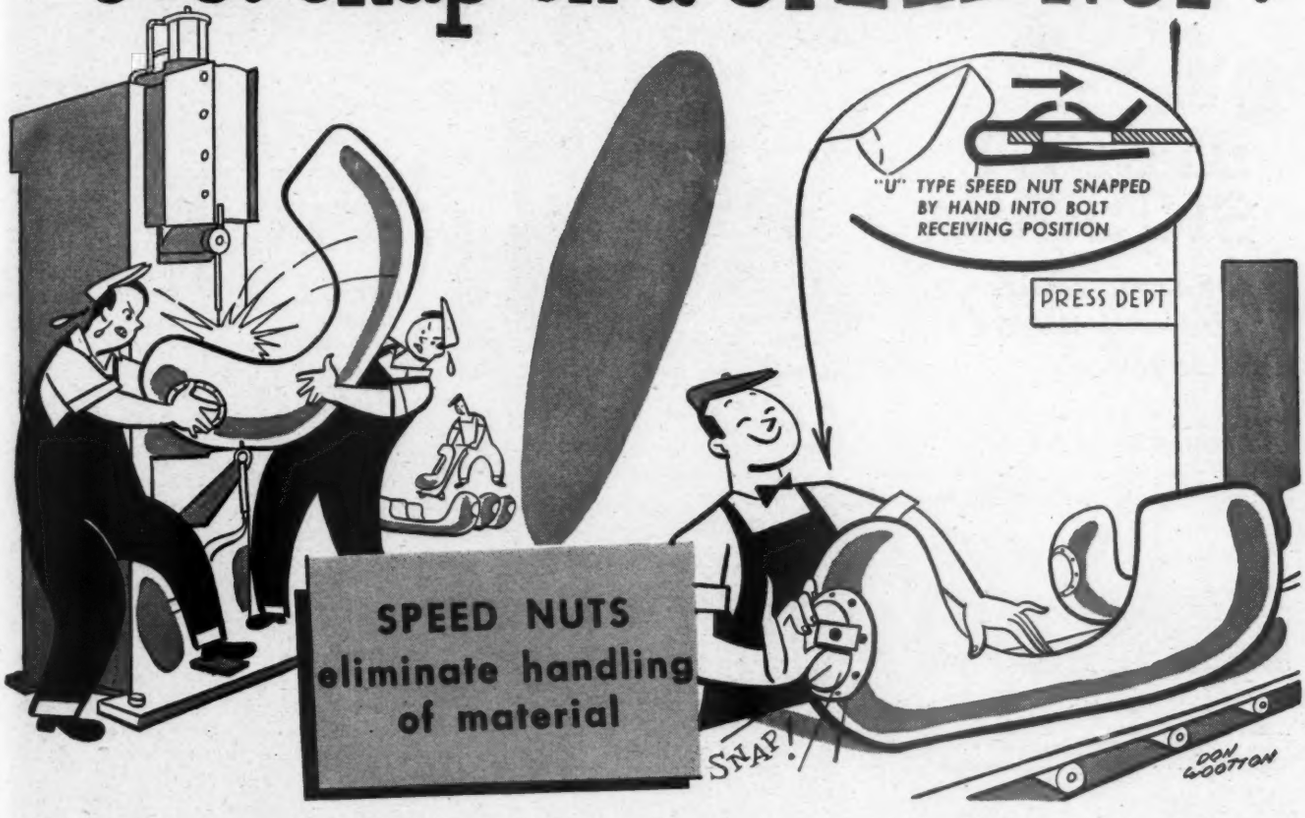
◆

FAIRBANKS, MORSE ANNIVERSARY.—Fairbanks, Morse & Co., 600 South Michigan avenue, Chicago 5. "Pioneers in Industry," a 160-page book, 8¾ in. by 10¾ in., printed in color. A narration of the growth and activities of the company from 1830 to 1945. Prologue discusses the Fairbanks organization through its earlier years. Part I, in four chapters, tells of the company's pioneering in scales; in windmills, pumps and railroad equipment; in the gasoline engine and ball-bearing motors, and in Diesel engines. Part II, also in four chapters, describes the Fairbanks-Morse plants as they are today and the company's activities in the second World War. It also enumerates the fields in which Fairbanks-Morse products are now serving the nation. The men who have been responsible for the growth of the company have "managed to find in the ever-changing circumstances of the American scene constantly expanding opportunities for constructive achievement." Recurring throughout the book is a sense of the debt owed by these men to the American ideals of free play for individual resourcefulness and initiative.

◆

RESISTANCE MEASURING INSTRUMENTS.—James G. Biddle Co., Philadelphia, Pa., four-page bulletin describes three different types of "Megger" instruments for measuring low resistance: the "Bridge-Meg" resistance tester—a combination Wheatstone bridge and "Megger" insulation tester; the "Ducter" low-resistance ohmmeter, which operates by pointer deflection down to .000001 ohm; and the Midget "Megger" circuit testing ohmmeter, which reads from

Why do it the hard way ?
Just snap on a SPEED NUT !


"U" TYPE SPEED NUT SNAPPED BY HAND INTO BOLT RECEIVING POSITION
PRESS DEPT
SPEED NUTS eliminate handling of material
SNAP!
DON WOOTTON

A SPEED NUT CASE HISTORY

One car builder used four welding machines to attach cage nuts on fender stampings for head lamp assembly. Three men were needed for each machine . . . one hauled stampings from the press department and two more wrestled the stampings and located them in fixtures on the welder. Because of all this handling, stampings were frequently damaged. And after painting, threads had to be re-tapped.

Changing to self-retaining Speed Nuts radically reduced the costs of this operation! Two men now do this work on a conveyor and quickly snap the Speed Nuts into place by hand. We will be glad to give you complete details of this case history on request.

* * *

In Canada: Wallace Barnes Co., Ltd., Hamilton, Ontario
In England: Simmonds Aerocessories, Ltd., London
In France: Aerocessoires Simmonds, S.A., Paris
In Australia: Simmonds Aerocessories, Pty. Ltd., Melbourne

Time was when the only way to fasten a nut in place for blind location assembly was to weld, rivet or clinch a cage nut over the bolt hole. This anchored the nut . . . but man, what a job it was!

Changing to Speed Nuts really simplifies this type of operation! Effort is reduced to a fraction — hands freed for more productive work. Welding machines eliminated. Less floor space needed. And, there is less handling and easier final assembly. You get all this *plus* a better finished product because the spring tension lock of Tinnerman Speed Nuts *prevents vibration loosening.*

There are many types of self-retaining Speed Nuts . . . all designed to drastically reduce the cost of blind location fastening. Let us show you how they can be used on your product to effect really worth-while savings. Send in your assembly details today!

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MORE THAN 3000 SHAPES AND SIZES

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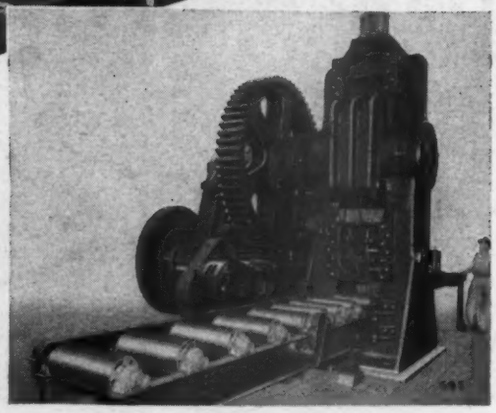

THOMAS *Heavy Duty* Billet Shears are built in capacities from 500 to 2000 tons, with the primary objective of delivering to the user many years of efficient, trouble-free service. *And they do!*

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a fraction of an ohm up to 200,000 ohms. Instruments suitable for both shop and laboratory use.

◆

INDUSTRIAL PROTECTIVE CLOTHING.—The B. F. Goodrich Company, Akron, Ohio. Ten-page catalog section on industrial protective clothing for firemen, policemen, and workers in the construction, transportation and chemical fields.

◆

METAL-FABRICATION SERVICES. — Hungerford Corporation, Big Flats, N. Y. Sixteen-page booklet of pictures showing Hungerford equipment for cutting, forming, arc welding, oxyacetylene welding and spot welding, also items produced to customers' specifications.

◆

STAINLESS-STEEL CASTINGS.—Allegheny Ludlum Steel Corporation, Brackenridge, Pa. "Blue Sheets" of reference data give, in condensed form, physical properties, corrosion and oxidation resistance, effects of elevated temperature, and heat-treating procedures and results with Allegheny stainless-steel castings; stainless Types 347 and 321, and Ludlum 609 shock-resisting steel for tools and machine parts.

◆

SILASTIC. — Dow-Corning Corporation, Midland, Mich. "Silastic Facts No. 1", the first of a series of pamphlets to be issued by this company, introduces the new and improved Silastic, the Dow-Corning Silicone rubber, useful over a temperature range of 70 to 500 deg. F. "Silastic Facts No. 1A" contains information about the established uses for Silastic and tables giving physical, electrical, and chemical properties of Silastic products.

◆

"STEAM DETERGENT CLEANING".—Oakite Products, Inc., 46 Thames street, New York 6. Twenty-eight page illustrated booklet, describes steam detergent cleaning with Oakite solution-lifting guns for removing grease, oil, dirt, etc., from machinery equipment and parts for subsequent repair and overhaul; for preparing equipment surfaces for repainting or refinishing; for cleaning equipment too large for tank immersion, and for paint stripping.

◆

WROUGHT IRON.—A. M. Byers Company, Pittsburgh, Pa. "101 Uses for Wrought Iron"—a 32-page book depicting the utilization of wrought iron piping, bars and flat rolled products. Railroad applications include wrought-iron floor, blast and brine plates, locomotive staybolts, drawbars, locomotive piping systems, smokejacks, boiler-washing systems, etc.

◆

"CORROSION OF STEELS".—Carnegie-Illinois Steel Corporation, Pittsburgh, Pa. Sixteen-page booklet, published by Carnegie-Illinois and other subsidiaries of the United States Steel Corporation, indicates how various commercial steels may reasonably be expected to resist the attack of atmospheric corrosion in particular. It includes only information now generally accepted as reliable and discusses the corrosion resistance of copper steels and of irons and plain carbon steels; the corrosion resistance of Cor-Ten and other low-alloy, high-strength steels relative to that of copper or carbon steels, and non-metallic coating as preventives of corrosion of steels.